BioCel® User Guide

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1 Introduction

This chapter introduces the *BioCel User Guide*, provides technical support and safety information, and describes the resources available to you for effectively finding the information you need.

What This Guide Covers

VWorks Version

This guide covers the hardware and software operations of the BioCel®. This version of the guide is only for use with VWorks™ version 6.0 and the following major software components.

Component	Version
APCUPS.ocx	2.1
BioIO.ocx	3.0
BioTekWasher.ocx	1.0
deviceenumerator.dll	2.0
iSeries.ocx	1.0
Multidrop.ocx	1.0
PlateLoc.ocx	5.0
PlatePierce.ocx	2.2
QFill.ocx	2.1
Robot.ocx	5.1
Spectrafluor.ocx	1.0
Teleshake.ocx	1.0
Ultramark.ocx	2.0
V11Labware.dll	4.0
V11Liquids.dll	2.0
V11Security.dll	2.0
VCode.ocx	2.1
VCode3.ocx	1.0
VPrep.ocx	10.0
VSpin.ocx	3.0
VStackBionet.ocx	4.0

To find version information for your software:

1. Start VWorks.

   For more information, see "Starting VWorks" on page 45.

2. Select **Help > About VWorks**.

   The About VWorks window lists the version number of the software and the version numbers of its major components.

What This Guide Does Not Cover

This guide does not cover the:

- ❑ Operation of Velocity11® modules, such as the PlateLoc® and VPrep®, when used in stand-alone mode
- ❑ Operation of third-party devices, with the exception of the use of diagnostics software that is developed by Velocity11 for third-party devices

For more information about these topics, see the user guides for the relevant modules.

BioCel Versions

Because the BioCel is available in different sizes and can further be customized, your BioCel may not be exactly as described in this guide.

Formats of This Guide

Introduction

This guide is provided in three formats:

- ❑ Online Help
- ❑ PDF
- ❑ Printed book

Each format has advantages and disadvantages. To work most effectively it helps to understand when to use each format.

Online Help

The online help is the best format to use when you are working at the computer, when you want to see information in color, and when you want to perform fast or advanced searches for information.

The online help is a single file named BiocelUserGuide_<*version*>.chm, located in the folder c:\vworks workspace\docs.

Note: The online help guide requires Microsoft® Internet Explorer, version 4 or greater, and it can only be viewed on a Microsoft Windows® platform.

For more information about using online help, see "Online Help Overview" on page 6.

PDF Guide

The PDF version of this guide is named BiocelUserGuide_<*version*>.pdf and is located in the folder c:\vworks workspace\docs.

The main purpose of the PDF version of this guide is to allow you to print more copies. You can also use the PDF guide on your computer to perform simple searches using the Find button.

Note: Do not use the similar-looking Search button. This button requires a specially generated index, which is not provided with this guide.

In the PDF version, the viewing quality of graphics varies with the magnification you select in your PDF viewer. If you want to see more detail in a graphic, try adjusting the magnification, or print the page. Line drawings are optimized for print in the PDF version and are displayed in high-resolution grayscale only.

Blue text indicates hyperlinks that you can click to jump to the referenced destination.

For more information about using PDF documents, see the Adobe Acrobat PDF help system.

To open the PDF help system:

1. With the PDF file open, select **Help** > **Acrobat Help**.

Printed Book

The printed form of this guide, which is shipped with your BioCel, is the best option for reading large sections of text, and is the only option available when working away from the computer.

Online Help Overview

Opening the Online Help

To open the online help:

1. Navigate to c:\vworks workspace\docs.
2. Double-click BioCelUserGuide_<*version*>.chm.

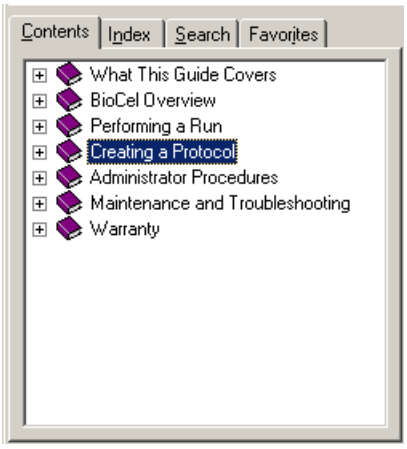
For quick access, you may want to create a shortcut to this file on your desktop.

Main Features

The online help viewer includes a navigation pane, content pane and toolbar.

Navigation Pane

The navigation pane has four tabs. Use this pane to quickly locate information.



Content Pane

The content pane displays the online help topics.

BioCel User Guide (VWorks 6.0)
Show
Back
Forward
Print
Options
VELOCITY 11™
What This Guide Covers
VWorks Version
This guide covers the hardware and software operations of the BioCel. This version of the guide is only for use with VWorks version 6.0.
To find the version number of your VWorks software:
1. Start VWorks.
For more information, see Launching VWorks.
2. Select Help > About VWorks.
The About VWorks window lists the version number of the software and the version numbers of its major components.
What This Guide Does Not Cover
This guide does not cover the:
• Operation of Velocity11 modules, such as the PlateLoc and VPrep, when used in stand-alone mode
• Operation of third-party devices, with the exception of the use of diagnostics software that is developed by Velocity11 for third-party devices
For more information about these topics, see the user guides for the relevant modules.

Toolbar

Use the toolbar to navigate, print and set general options for how you want to display the help.

Moving Around the Guide

You can page through the online help just as you would turn successive pages in a printed book.

To move to the next or previous page:

1. Click the relevant arrow icon in the content pane.

If you use another navigation tool to jump to a page in the guide, you can jump back to the previously viewed page.

To jump back to the previously viewed page:

1. Click the **Back** button on the toolbar.
2. You can reverse the jump by clicking the **Forward** button.

Hyperlink Colors

The standard hyperlink color is blue. When you visit a page, all hyperlinks that reference that page turn purple to remind you that you have already been there. After a period of time, determined by your Microsoft Internet Explorer options, visited links will return to the standard blue color.

You can reset the hyperlink colors manually.

To change hyperlink colors manually:

1. From the toolbar, select **Options > Internet Options**.
2. Click **Clear History**.
3. Click **OK**.
4. Click in the close box of the help viewer to close the help.
5. Open the online help file.

   For more information about opening the online help, see "Opening the Online Help" on page 6.

You can change the period of time after which visited links return to the normal, blue color by changing how long you keep Web page history.

To change the duration of Web page history:

1. From the toolbar, select **Options > Internet Options**.
2. In the **Days to keep pages in history** text box, type how long you want to keep the hyperlink history.
3. Click **OK**.

Accessibility

If you have a visual impairment, you can change the appearance of the online help text to make it easier for you to read. For example, you can use your own style sheet to make text large and green.

To change accessibility options:

1. From the toolbar, select **Options > Internet Options**.
2. Click **Accessibility**.
3. Select the appropriate options.

For more information about accessibility options, see Internet Explorer's online help.

Improving Text Appearance with Screen Effects

If the online help text appears jagged, and you are viewing it on the Windows XP operating system, you may be able to improve its appearance by changing your Windows screen effects settings.

To improve text appearance on Windows XP:

1. Right-click on the desktop and select **Properties**.
2. In the **Display Properties** dialog box, click the **Appearance** tab.
3. Click **Effects**.
4. Select **Use the following method to smooth edges of screen fonts**.
5. If you are using a:
   - CRT monitor, select **Standard** from the list box
   - Flat panel monitor, select **ClearType** from the list box
6. Click **OK** to close all dialog boxes.

Online Help: Using the Navigation Pane

Hiding the Navigation Pane

At any time, you can hide the navigation pane to make more room on the screen.

To hide the navigation pane:

1. Click **Hide** on the toolbar.

2. Click **Show** to show the navigation pane again.

Viewing the Help Contents

The Contents page of the navigation pane is displayed when you first open the help system. Each book icon represents a collection of topics that is equivalent to a chapter in the printed book. You can expand the book icons to see the topics covered in that section.

See "Navigation Pane" on page 6 for a picture of the Contents page of the navigation pane.

Locating Topics Using the Index

You can search for information using the online index.

To use the online index:

1. In the navigation pane, click the **Index** tab.
2. Either:
   - Type the term that you are looking for in the text box.
   - Scroll down the index and select the subentry that you are looking for.

     Main index entries are used to group subentries and are not themselves associated with a topic.
3. Click **Display**.

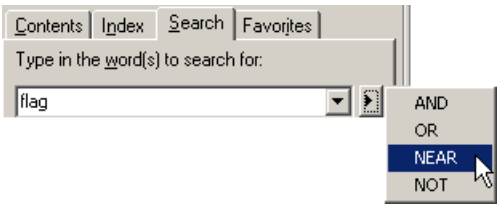
Performing an Advanced Search

The online help guide has built-in advanced search tools. It will save time if you become familiar with the available search options and think about your search strategy before typing in keywords.

To perform an advanced search:

1. In the navigation pane, click the **Search** tab.
2. In the text box, type one or more search words, separated by Boolean operators if required.

   Boolean operators are the words AND, OR, NOT and NEAR that you can add to make the relationship between two words more specific. To add them you can place the cursor between two words, click the triangle to the right of the text box, and select the appropriate operator.

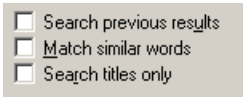


You can also type in operators directly. Note that the |, & and ! characters cannot be substituted for the Boolean operators OR, AND and NOT.

If you type...	**The search will return...**
signal task	Topics containing both the word “signal” and the word “task.” When you do not include an operator between words, as in this example, the Boolean operator AND is implied.
“signal task”	Topics containing the text phrase: signal task
signal AND task	Topics containing both the word “signal” and the word “task.” The more terms you combine with AND, the fewer topics you will return.
signal OR task	Topics containing the word “signal” and topics containing the word “task.” This search will return the largest number of topics.
signal NOT task	Topics containing the word “signal” but not the word “task.”
signal NEAR task	Topics containing the word “signal” within eight words of the word “task.”
task AND (signal OR waitfor)	Topics containing the word “task” and either the word “signal” or the word “waitfor.” In this nested expression, the parentheses force the order of processing by the search engine. In this case, “signal” OR “waitfor” is evaluated first. Without parentheses, a query is evaluated in order from left to right. *Note:* The maximum number of nested levels is five.
*txt	Any word ending in txt, such as: log.txt *Note:* An asterisk must be used to represent part of a word. It cannot be used to represent a whole word.

If you type...	The search will return...
80?86	The search term in which the question mark is substituted for another character. *Note:* A question mark must be used to represent a single letter of a word. It cannot be used to represent a single-letter word.

3. At the bottom of the navigation pane, optionally select one or more of the following:



Option	Description
Search previous results	Narrows a search by searching within the results of a previous search. This is useful if your first search returns a large number of topics.
Match similar words	Searches for the word you type, as well as words of similar construction. For example, searching for the word compile will also find instances of compiled, compiles, compiling, compiler, compilation, and so on.
Search titles only	Searches for the word in topic titles only. This is useful if you are looking for a major subject.

4. Click **List Topics**.
5. Double-click a topic title to display the topic in the content pane.

   The words you searched for are highlighted in the content pane.
6. If you want to remove the search results highlights, select **Options** > **Search Highlight Off**.

When Your Search Result is Not What You Expect

If your search includes certain common words, it may not return the results you expect. This is because common words are ignored to make searches faster. For example, if you search for "log in as" the words "in" and "as" are ignored and only instances of "log" are returned.

If your search terms contain only ignored words, or if they contain parentheses with only ignored words, you will receive an error message. Examples are:

- ❑ Did not
- ❑ log NEAR (in NEAR as)

  In this case, "in NEAR as" cannot be evaulated because "in" and "as" are ignored words.

The words that are ignored are:

a, about, after, all, also, am, an, and, another, any, are, as, at, be, because, been, before, being, between, biocel, both, but, by, came, can, click, come, could, did, do, does, each, etc, for, from, get, goes, got, had, has, have, he, her, here, him, himself, his, how, if, in, information, into, is, it, its, let, like, make, many, me, might, more, most, much, must, my, never, nor, not, now, of, off, on, one, only, or, other, our, out, over, own, said, same, see, select, set, shall, she, should, since, so, some, still, such, take, than, that, the, their, them, then, there, these, they, this, those, though, through, to, too, under us use, velocity11, very, was, way, we, well, were, what, when, where, which, while, who, why, will, with, would, yes, yet, you, your.

Bookmarking Favorite Pages

If there are topics that you refer to frequently, you can bookmark them to make it faster to locate them in the future.

To bookmark a page:

1. Navigate to the page that you want to bookmark.
2. In the navigation pane, click the **Favorites** tab.
3. Click **Add**, at the bottom of the navigation pane.

To locate a bookmarked page:

1. In the navigation pane, click the **Favorites** tab.
2. Select the page from the list of topics.
3. Click **Display**.

Support Information

Contact Us

Use the following information to contact Velocity11.

Organization	Contact Method	Contact Details
General	Phone	650-846-6500
	Fax	650-846-6520
	Email	info@velocity11.com
Service	Phone	1-800-979-4811 650-846-6523
	Email	service@velocity11.com
Sales	Phone	1-866-428-9811
	Email	northeastsales@velocity11.com southeastsales@velocity11.com midwestsales@velocity11.com westsales@velocity11.com europeansales@velocity11.com

Web Site

For the latest company information, visit the Velocity11 Web site at http://www.velocity11.com.

Reporting Errors

If you find an error in the Velocity11 software or documentation please let us know by sending us an email using either:

- ❑ The bug reporting feature of VWorks, which is described below
- ❑ Your own email software

In your message, write a summary of the error and, in the case of a software bug, tell us how we can reproduce the error. Also include a phone number in case we need to contact you.

Setting Up the Bug Reporting Feature

Before you can send a bug report the:

- ❑ BioCel computer must be connected to your building's network.

  For more information about the network connection, see "The Computer and Networking" on page 37.
- ❑ SMTP (outgoing) email server for the computer must be set up on the BioCel by a BioCel or network administrator.

To set up the SMTP email server:

1. Select **Tools** > **Options**.
2. In the **VWorks Options** dialog box, click the **Email Setup** tab.
3. In the **Mail Server Setup** group box, enter the name of your SMTP outgoing email server.
4. If the server requires a user name and password:
   a. Select the **Server requires authentication** check box.
   b. Enter the **User name** and **password** that you use to access email on the network.

      This information only needs to be set up once, provided the email account remains active. All email sent from your BioCel is authenticated using this account.

Sending a Bug Report

A bug report is an email that you create and send from within VWorks. The email, which automatically identifies your BioCel, is sent directly to Velocity11.

To send a bug report:

1. Select **Help** > **Report a bug**.
2. Type a description of the error in the text box.

   In your description, provide a summary of the error and a description of how we can reproduce it.
3. If you have a log file that includes information about the problem:
   a. Select the **Attach log files** check box.
   b. Click the ellipsis button (...), browse to the log file, and click **Open**.
   c. Click **Email Velocity11**.
   d. Wait until a **Message Sent** message box opens.

For information about using email to notify you or others of BioCel errors, see "Setting Error Options (Optional)" on page 57.

Safety Information

Warnings

Read and follow the warnings that are included in this guide. Each type of warning, along with a description of what it means, is shown below:

!! INJURY HAZARD !! You, or someone else, may be injured if you do not follow the advice in this warning.

!! DAMAGE HAZARD !! You may damage your equipment if you do not follow the advice in this warning.

!! IMPORTANT !! If you do not pay attention to this warning, the procedure may not work, or you may lose data or samples.

For more information about general hazard warnings, see "General Hazard Warnings" on page 19.

This product must only be used in the manner in which Velocity11 intends, as described in this guide. Any other use may damage the product or harm the user. Velocity11 is not responsible for damages caused, in whole or part, by unauthorized modifications or maintenance procedures not explicitly expressed in this user guide. Any modifications or changes to this product not expressly approved in this guide could void the warranty.

Safety Labels

Pay attention to safety labels printed on your BioCel. A safety label consists of a warning symbol, a description of the warning and information that will help you to avoid the safety hazard.

An example safety label is shown here:

Chemical Hazards

Some chemicals used with this product may be hazardous. Make sure that you follow the recommendations in the MSDS (Material Safety Data Sheet) for chemicals you plan to use with this product. The manufacturer of the chemical should provide you with the MSDS if you need it.

Waste Disposal

Remember to dispose of chemicals used with this product in accordance with local, state and federal regulations.

Before Using the BioCel

Before using the BioCel, your company should make sure that you are properly trained in:

- ❑ General laboratory safety
- ❑ The correct and safe operation of the BioCel
- ❑ The correct and safe operation of the modules used with the BioCel

If you are the person in your company responsible for training others on this product and you have a safety question relating to the BioCel, please take the time to ask us.

For information about contacting Velocity11, see "Support Information" on page 14.

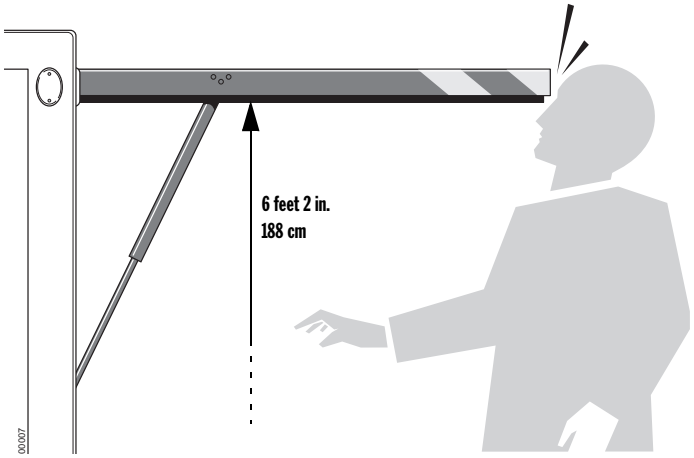
General Hazard Warnings

Introduction

This section gives more information for some hazard warnings found in this guide. Be aware of these hazards at all times when using the BioCel.

Overhead Door Injury Hazards

!! INJURY HAZARD !! Opened overhead doors are approximately 6 feet 2 inches (188 cm) above the floor. Be aware of the door height and position at all times when working around the BioCel to avoid injury.



!! INJURY HAZARD !! The pneumatic braces on overhead doors should be adjusted so you can comfortably open and close the doors. If you have to strain to open one or more doors, please contact our Service Center and ask to have the braces adjusted.

Overhead Door Damage Hazard

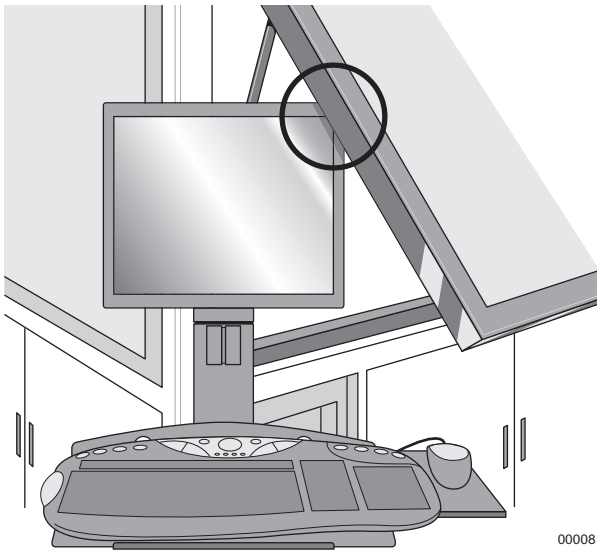
!! DAMAGE HAZARD !! Always open and close overhead doors using their handles. Opening and closing overhead doors by pulling and pushing on their corners may crack the glass and damage the pneumatic braces.

Side Door Injury Hazard

!! INJURY HAZARD !! Always close side doors as soon as you finish the operation that that led you to open them. Leaving side doors open creates a tripping hazard. It can also block access and escape routes in a laboratory.

Computer Monitor Damage Hazard

!! DAMAGE HAZARD !! To avoid damage to the computer monitor, make sure that you move the monitor out of the way as you close the overhead doors.



Interlock Override Hazard

!! INJURY HAZARD !! Only fully trained BioCel administrators should have access to, and use of, the safety interlock key. Use the override only when you know how the robot and VPrep modules will move during the protocol, when the robot speed is slow, and when you have taken measures to keep away from the areas in which the robot and VPrep parts will be moving.

With the interlock overridden, it is possible to be hit by the robot when it is moving. If this happens, the robot is designed to immediately stop, minimizing injury, and the likely outcome is minor bruising. However, not all circumstances can be foreseen and more serious injury is possible. It is the responsibility of every operator to use the built-in BioCel safety features, follow warnings and safety labels and keep out of the robot's radius whenever it is likely to move.

Laser Warnings

BioCel Lasers

Your BioCel contains lasers used to read bar codes. One bar code reader, attached underneath the robot arm, is used to read plates as they are picked up. Other bar code readers may be included on your system, attached to platepad readers, VPrep shelves, or VCode® printers.

!! INJURY HAZARD !! The bar code readers use class 2 lasers. Before using the BioCel, you should be trained in the safe use of these lasers.

The laser beam will not harm your skin so there is no danger in exposing your arms or hands to the beam. However, you could damage your eyes if you stare directly into the beam.

Bar code readers only emit light for an instant when taking a reading so they are only a hazard during operation of the BioCel. When a plate is being read, the beam should should not pass beyond the plate. If you are operating the BioCel without plates, and with the overhead doors open, the risk of exposure is increased.

Before using the BioCel you should identify the locations of all bar code readers and establish the directions in which they point. All readers point downwards to minimize the potential exposure at eye level. The robot bar code reader represents the greatest hazard because of its height above the table. This bar code reader is angled downwards at 15 degrees and has a maximum illumination arc of 60 degrees, centered perpindicularly to the reader. With these measurements you can establish the space that is illuminated on occasions when there is no plate in the robot gripper.

!! INJURY HAZARD !! Class 2 laser hazard. Do not look directly at the laser beam. Looking directly at the laser beam may result in serious eye injury.

!! INJURY HAZARD !! Do not disassemble bar code reader sensor heads. Laser emission from the reader is not automatically stopped if the sensor head is disassembled.

!! INJURY HAZARD !! Do not touch the white button on the side of the bar code reader sensor head. This button turns on the laser creating the possibility of a long exposure to the beam.

Third-Party Module Lasers

Your BioCel may also contain lasers built in to third-party devices, such as Zeiss Multimode readers. For information about laser safety for third-party modules, see the relevant module documentation.

BioCel Overview 2

This chapter:

- ❑ Introduces the hardware, software and major systems
- ❑ Discusses the levels of user privileges
- ❑ Lists the modules that can be used with the BioCel® to automate laboratory procedures

Basic Description

Introduction

The BioCel is a microplate-processing automation platform that is used in combination with modules for applications such as:

- ❑ Sample preparation
- ❑ Plate replication
- ❑ PCR purification
- ❑ High throughput screening

To operate the BioCel, you should be familiar with the operating procedures in this guide as well as the guides for the modules installed on your BioCel.

Basic BioCel Components

Every BioCel includes:

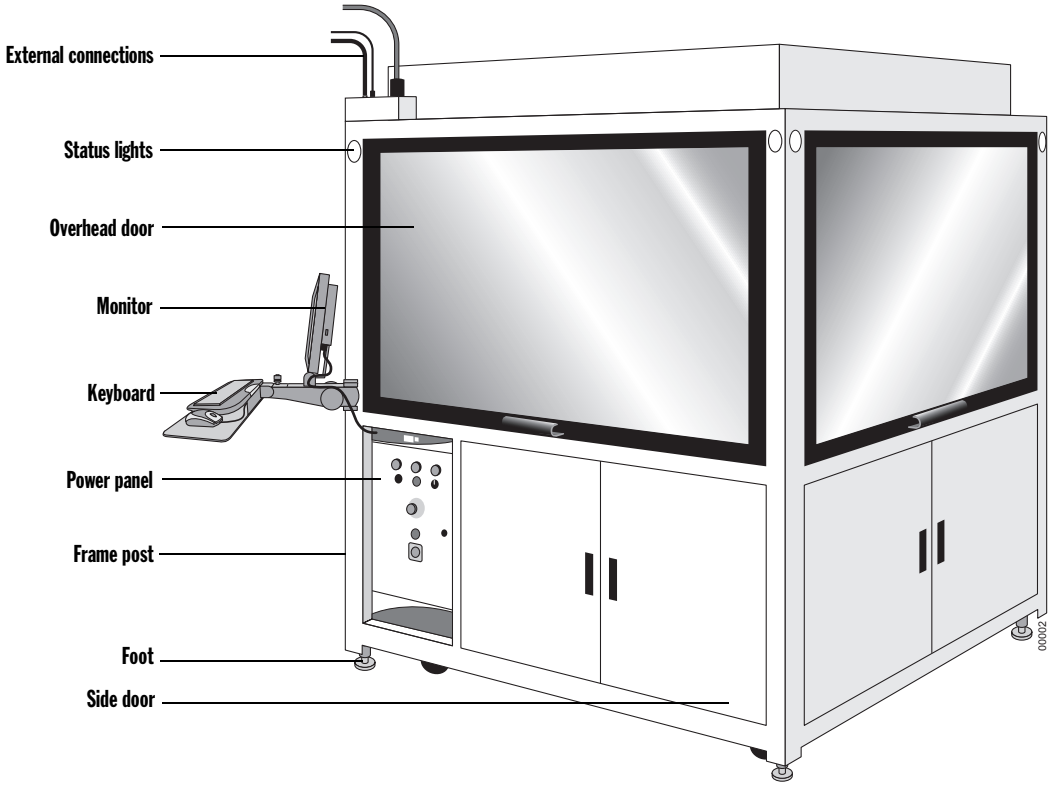
- ❑ A frame
- ❑ A table
- ❑ A robotic arm
- ❑ A controlling computer, monitor, keyboard and mouse
- ❑ A main power panel, and electrical supply circuits
- ❑ Communication hubs and cables
- ❑ A Bio I/O console for managing sensor information
- ❑ One or more uninterruptible Power Supplies (UPSs)
- ❑ An AC/DC converter (DC power supply)
- ❑ An air system that includes a main air panel, pressure regulators, an air filter and air lines
- ❑ VWorks software
- ❑ Software for each module

For information about optional custom components, see "Optional BioCel Components" on page 36.

Hardware: External Features

Main Features

The main external features of the BioCel are shown in the following diagram:

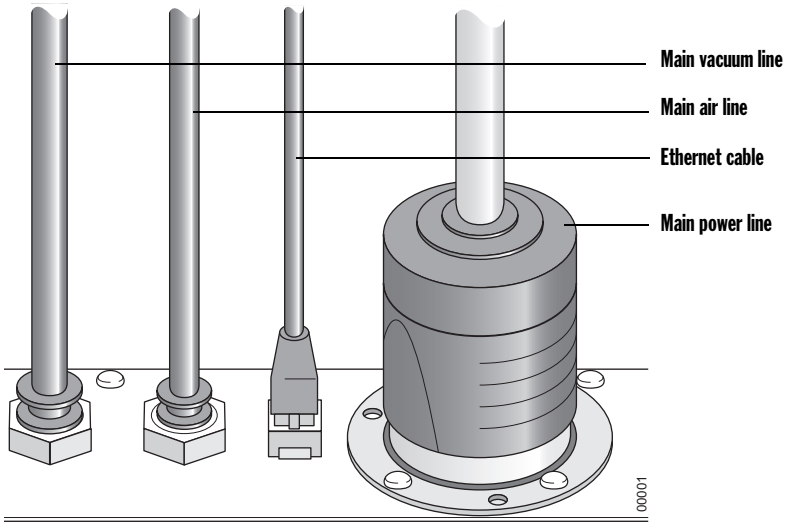


External Connections

There are usually four connections to external utilities on the BioCel, which provide the:

- ❑ Main vacuum line
- ❑ Main air line
- ❑ Ethernet cable that connects to your company's computer network
- ❑ Main power line

These connections are typically located above the post to which the computer is attached.



Your BioCel may also have direct plumbing lines for water and waste in place of reservoirs and waste containers.

Power Panel

You can use the power panel to:

- ❑ Turn on and off the main power and air supplies to the BioCel
- ❑ Override the safety interlock

  For more information see, "Overriding the Safety Interlock" on page 199.
- ❑ Activate an emergency stop.

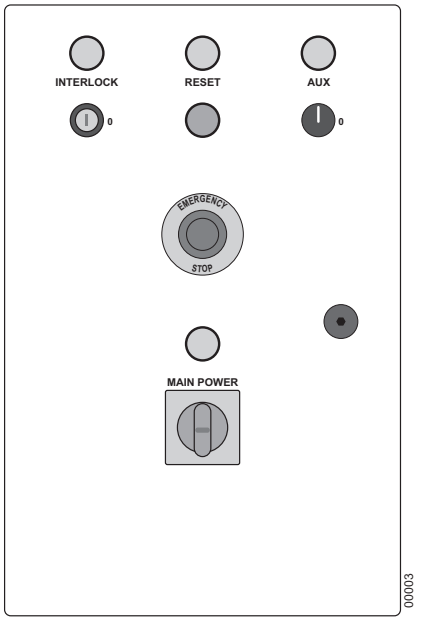
  For more information about using emergency stop buttons, see "Pausing, Stopping and Aborting a Run" on page 80.
- ❑ Reset the safety interlock after an emergency stop has been activated.

  For more information about recovering from an emergency stop, see "Emergency Stop Error Recovery" on page 195.
- ❑ Check the status of the BioCel.

  For more information about monitoring the BioCel status, see "Monitoring a Run" on page 83.

The power panel should only be opened by a Velocity11® service technician or a BioCel administrator, working under the guidance of Velocity11 service staff.

!! INJURY HAZARD !! Do not force open the power panel door. It has a safety device to prevent it from opening when the main power switch on the power panel is turned on.



Adjusting the Keyboard Shelf

You can adjust the computer shelf to position the keyboard, monitor and mouse to suit your requirements. To make the adjustments, swivel the shelf at the appropriate shelf joints. You can loosen or tighten the joints by prizing off the joint covers and making the adjustments with a wrench.

Hardware: Behind the Side Doors

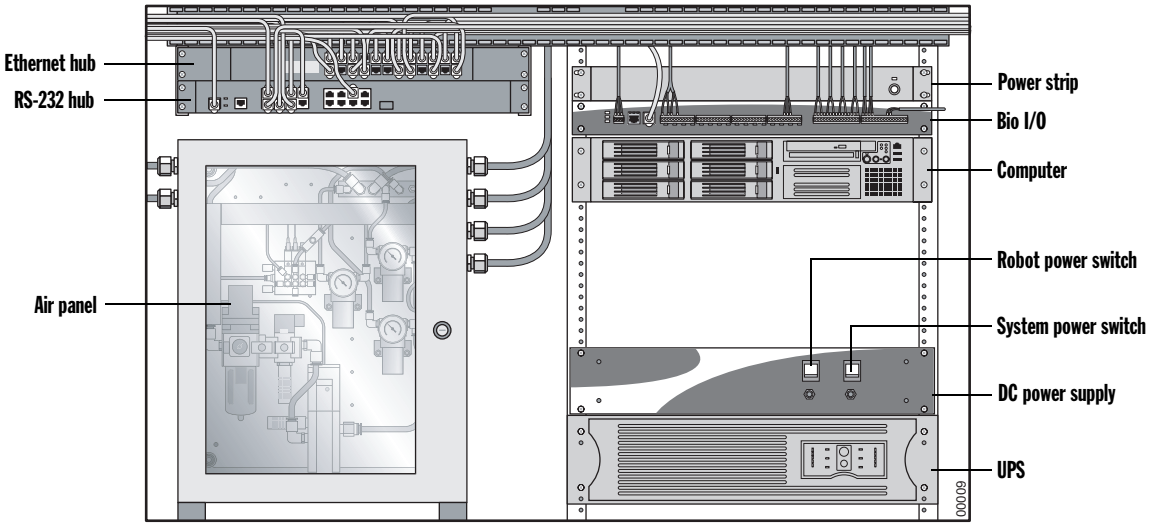
Side-Door Numbering

The side doors of the BioCel are numbered in a counterclockwise direction, typically starting at the computer monitor. The numbers are located inside the doors.

Main Hardware Components

The main hardware components, shown in the following diagram, are typically located behind doors 1 and 2.

Note: The exact locations of the components on your BioCel may be different.



The components located behind the other side doors vary with the modules used on your BioCel.

Communications Hubs

The Ethernet and RS-232 hubs act as cable splitters, allowing the BioCel's computer to communicate with many devices at once.

You should not need to touch the communications hubs.

Bio I/O Console

The Bio I/O console:

- ❑ Makes information from analog and digital sensors available to the computer.
- ❑ Initiates actions such as turning on the blue status lights, and opening and closing optional trash and enclosure doors.

Many of the thin, gray, low-voltage cables that run through the BioCel go to the Bio I/O.

You should not need to touch the Bio I/O.

Air Panel

The air panel contains components that control the flow of air to all parts of the BioCel.

The main regulator and main shutoff valve lie in between the:

- ❑ Main air line that provides house air
- ❑ Air switch on the power panel

You should note that the air switch is usually used to turn the air supply on and off and you should never need to use the main shutoff valve.

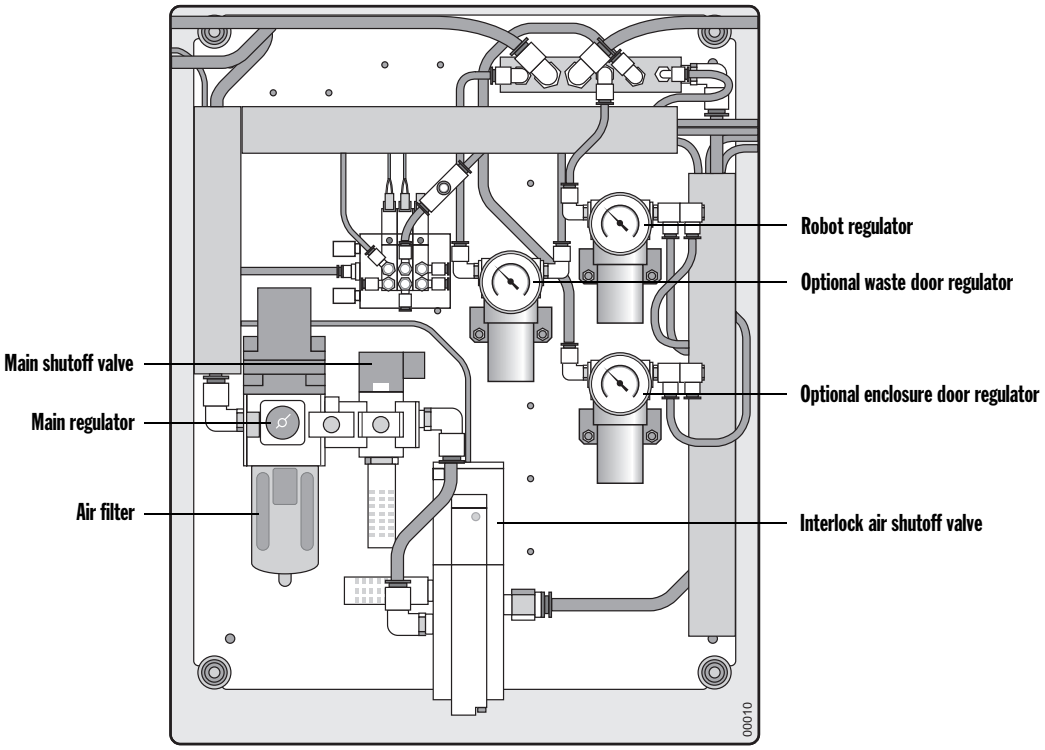
The interlock air shutoff valve shuts off air to moving parts when the interlock circuit is interrupted.

The air filter provides an extra purification step of house air.

!! IMPORTANT !! PlateLoc® modules intended for use with the BioCel do not contain an air filter. If you plan to remove a BioCel PlateLoc for use in stand-alone mode, you must contact Velocity11 and arrange to have a filter installed before use. Without a filter your PlateLoc may be damaged.

For more information about the functions of air on the BioCel, see "Air System" on page 33.

Information about the use of the air panel's components is provided in the relevant sections throughout this guide.

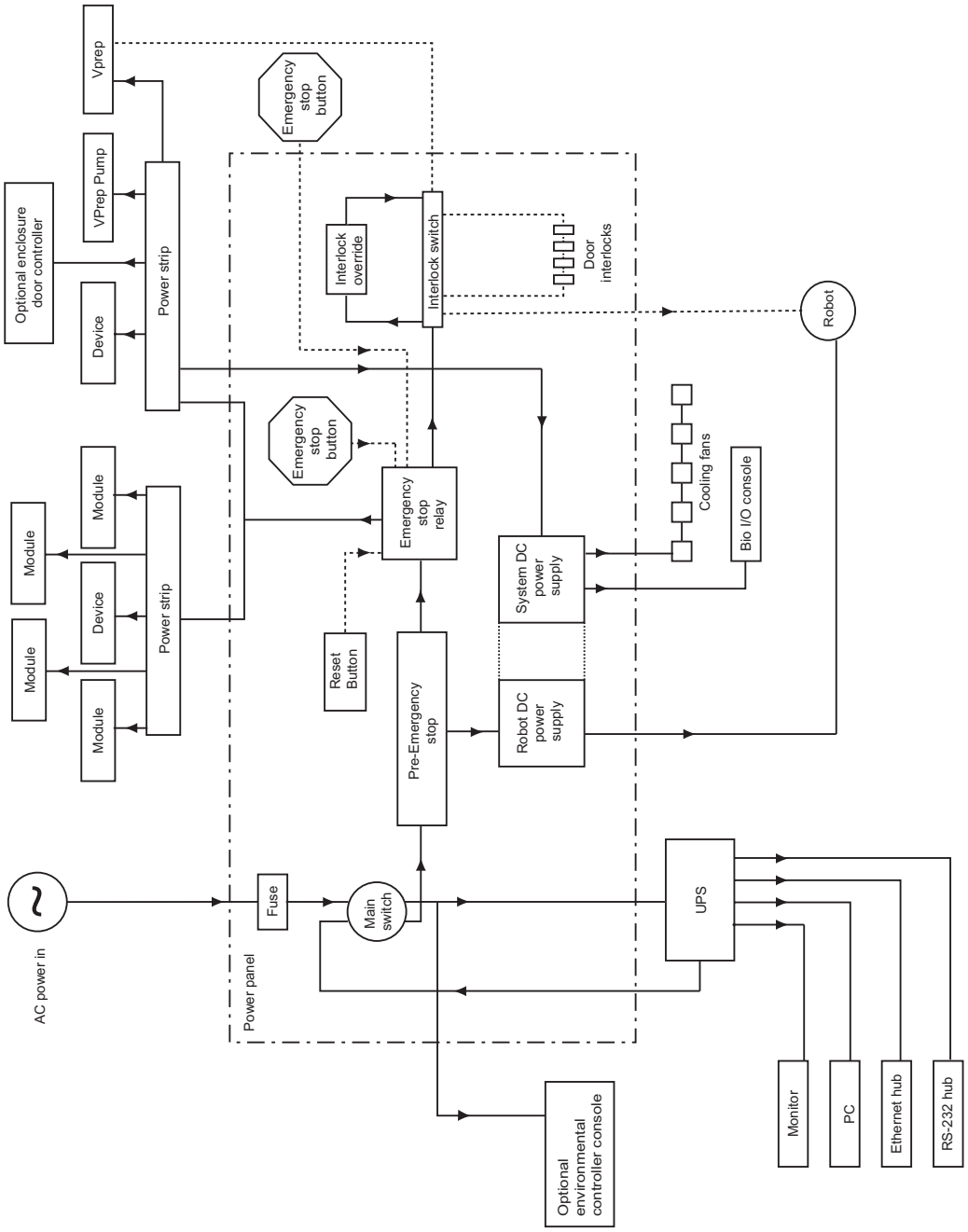


Power System

Power Circuit Overview Diagram

The diagram in this section summarizes the BioCel's power circuit. It is not intended to be an accurate wiring diagram.

In the diagram, dotted lines are control "enable" circuits and solid lines are AC and DC power circuits. The dot-dash line indicates those elements that lie inside the power panel. The dotted line between the robot DC power supply and system DC power supply indicates that the two power supplies are housed in the same box.



Description

Main Power

The mains AC power enters at the external connections and travels down inside the corner post to the power panel. It passes through a main fuse, through the main switch, and out of the power panel to the UPS.

Environmental Control

If your BioCel has environmental control, one or more electrical lines branch off before the UPS. These lines supply current to the environmental controller console that houses the iSeries controllers for the main BioCel (not for any separate environmental enclosures). The environmental controller console therefore receives pre-UPS, pre-emergency stop current. It is not affected by emergency stops or interlocks but is also not buffered by the UPS from power outages.

UPS Connections

If there is more than one UPS, they are connected in series so that current output from UPS 1 supplies the current input for UPS 2. The UPS, or UPSs, provide current backup to the monitor, PC and communications hubs. If there is more than one computer and more than one UPS, one computer is fed from one UPS and the other computer is fed from the other UPS.

From the UPS, current is passed back into the power panel and through the main switch to the rest of the BioCel. This means that when you turn off the main switch current is cut to the UPS, but it is also cut between the UPS and the main part of the BioCel, preventing the BioCel from draining the UPS. The UPS will continue to be drained by the computer, monitor and communication hubs, which is why the shutdown procedure includes a step for turning off the UPS. For more information, see "Shutting Down the BioCel" on page 92.

Pre-Emergency Stop

After the main switch, the electrical line enters a bank of connections in the power panel known as the pre-emergency stop. Modules and devices wired from the pre-emergency stop do not have their power cut when an emergency stop is activated. For example, the robot retains power after activation of an emergency stop because its DC power, is supplied by an AC-to-DC converter fed from the pre-emergency stop.

Emergency Stop and Interlocks

An electrical line from the pre-emergency stop enters the emergency stop relay which controls the emergency stop circuit. One output from the emergency stop relay powers an interlock circuit switch. Another output supplies the BioCel power strips from which most of the BioCel modules, devices and system components receive current. These modules, devices and system components are all wired after the emergency stop and therefore receive no current when an emergency stop is activated. This includes the Bio I/O and cooling fans, which run off DC electricity produced by the AC-to-DC converter. The part of the DC power supply that provides system DC electricity is isolated

internally from the part of the power supply that provides robot DC electricity.

If an emergency stop is activated, the reset button must be pushed to reset the emergency stop relay to a position that allows current to flow.

The door interlock system is fed AC electricity from the emergency stop relay. If an overhead door is opened during a run, the interlock switch cuts power to the enable wires that lead to the robot and VPrep®. This stops the robot and VPrep motors and turns on their respective Z-axis brakes. The brakes make sure that the VPrep head and robot do not drop, preventing damage and eliminating a crushing hazard.

The interlock switch is bypassed when the interlock override switch is activated by turning a key on the power panel. This maintains current in the enable wires even when the overhead doors are open.

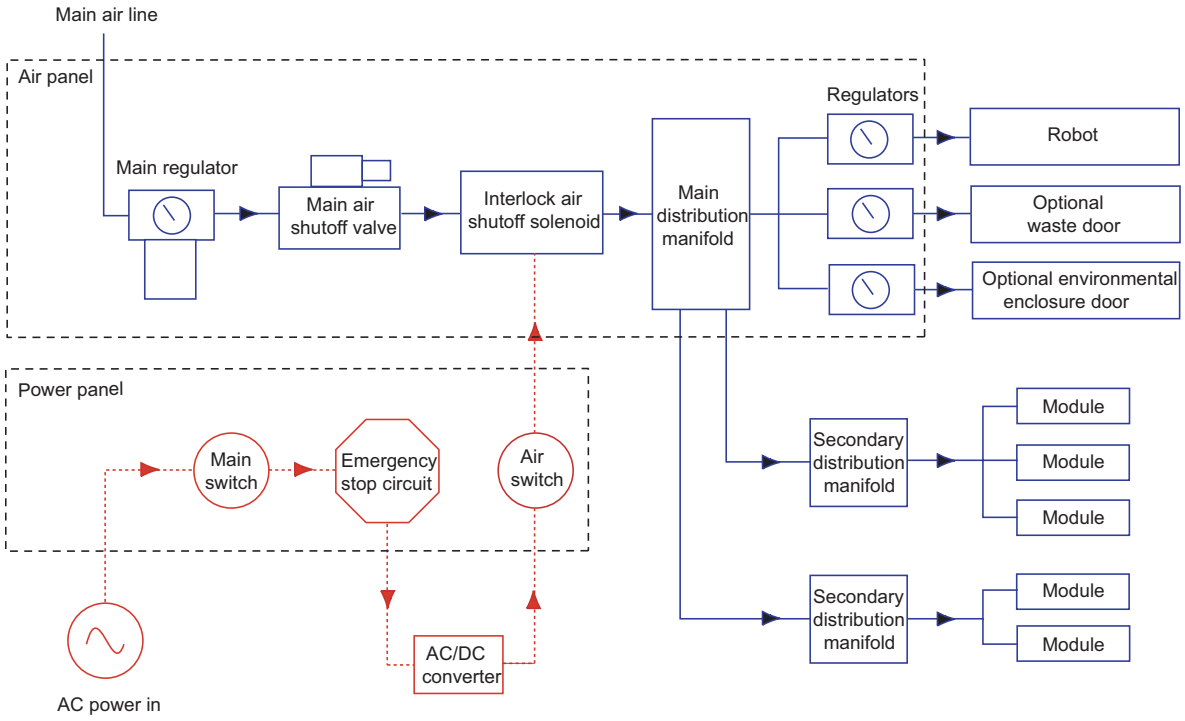
For more information about how individual components are affected by activation of emergency stop and interlocks, see “Comparing Interlock and Emergency Circuits” on page 82.

Air System

Diagram

The following diagram shows how the air and power systems interact.

For more information about the power system, see "Power System" on page 30.



Description

Air is used on the BioCel to:

- ❑ Move parts, such as the robot gripper, VStack® grippers and VPrep shelves
- ❑ Create vacuums, such as for the lid removal station's suction cups

The flow of air through the system is controlled by air pressure regulators. Many modules have their own, built-in regulators. Air pressure to other parts is controlled by regulators in the air panel of the BioCel.

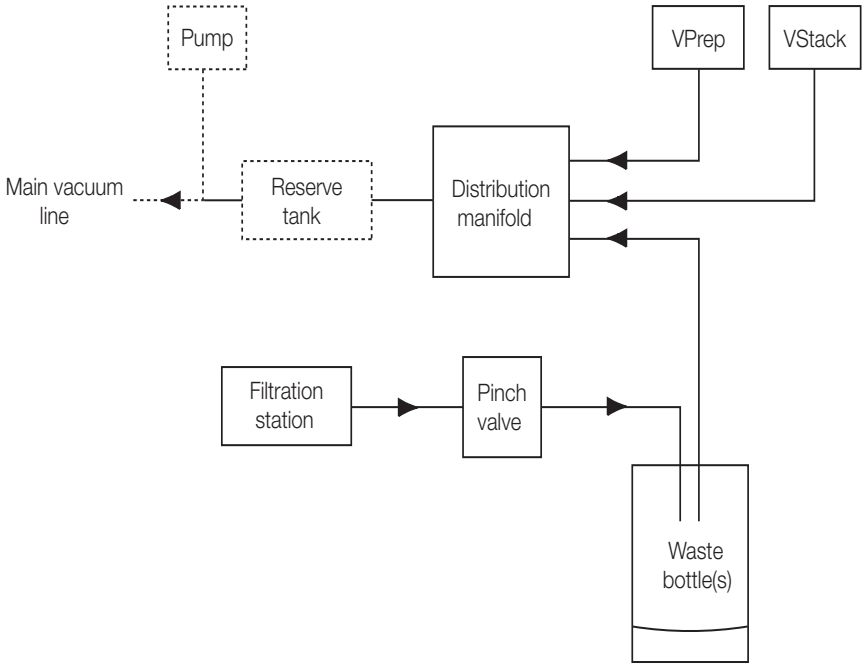
The diagram in this section illustrates how air is cut off to the BioCel during a run by:

- ❑ Pressing an emergency stop button
- ❑ Turning off the Air switch on the power panel
- ❑ Turning off the main air shutoff valve in the air panel
- ❑ Turning off the main power in the power panel

Vacuum System

Schematic

The following diagram shows the BioCel's optional vacuum system.



Description

A vacuum may be used for filtration stations, and for suction to hold plates flat on a VPrep shelf or VStack stage.

The vacuum can be created by a pump or supplied by a house vacuum system. If a house vacuum system is used, the main vacuum line enters the BioCel with the other external connections. For more information, see "External Connections" on page 25.

A reserve vacuum tank may be used to ensure an instantaneous vacuum supply.

Waste liquid produced by filtration stations is collected in one or more waste containers.

Vacuums are also created in modules and accessories using vacuum ejectors. Vacuum ejectors use an air line to create the vacuum at the required location, such as in the lid removal station.

For more information about the lid removal station, see "Lid Removal Station" on page 36.

BioCel Modules

Definition

Modules are individual pieces of equipment that sit on the BioCel table and manipulate microplates.L

Velocity11 Module List

The following Velocity11 modules can be used on a BioCel.

Module	Description and Comments
PlateLoc	Thermal plate sealer
PlatePierce™	Seal piercing station
VCode®	Bar code print and apply station
VPrep	Pipetting station
VSpin™	Microplate centrifuge
VStack	Labware stacker

Third-Party Modules

The following third-party modules can be used on a BioCel.

Module	Description and Comments
ASYS Hitech GmbH FlexiSpense	Automated microplate filler
BioRad Ultramark	Plate reader
Bio-Tek ELx405 Washer	Automated microplate washer
Genetix QFill2 Dispenser	Automated microplate filler
H+P Labortechnik AG Teleshake	Plate shaker
Tecan Spectrafluor	Plate reader
Tecan Ultra Multimode Reader	Plate reader
Thermo Labsystems Multidrop	Automated microplate filler
Zeiss Multimode	Plate reader

If there is another device or instrument that you would like to add to your BioCel, please contact Velocity11 for customization information.

Optional BioCel Components

Available Accessories

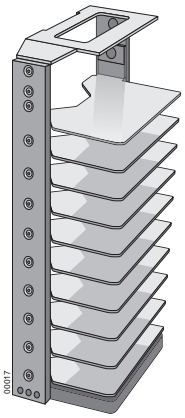
One or more of the following components may be present on your BioCel.

Accessory	Description and Comments
Auxiliary bar code reader	One or more bar code readers attached to a platepad or other device
Environmental Enclosure	Glass enclosed area for controlling temperature and humidity
HotPad	Lidded table position for heating microplates
Lid removal station	A static arm with suction cups that removes lids from plates and drops them into the waste bin.
Module shelf	Semi-circular shelf for holding a second tier of modules
Plate hotel	Plate stacking shelves allowing immediate access to any plate in the stack
Refrigeration block	Lidded table position for cooling microplates

Plate Hotel

A plate hotel stores a smaller number of plates than a VStack, but unlike the VStack, the robot has immediate, random access to all plates. You can remove the hotel from the BioCel to access plates from the front, or leave the hotel in the BioCel and remove the back plate to access plates from the back.

For more information about loading and unloading plates, see "Placing and Removing Hotel Plates" on page 72.



Lid Removal Station

The lid removal station sits over the waste opening in the table. It uses one or more suction cups to remove plate lids. The vacuum used to hold the lids is created by a vacuum ejector, which uses an air line rather than a vacuum line.

The Computer and Networking

Computer Functions

The BioCel computer is used to:

- ❑ Control the BioCel and its modules
- ❑ Input bar code labelling instructions
- ❑ Store and export log files
- ❑ Store and export data collected by plate readers
- ❑ Communicate with other computers on your company's network for exchange of files, reporting of errors and accessing email

Network Cards

If you are an administrator, and need information about the network cards in the BioCel, see "Network Cards" on page 162.

Module Computers

If your BioCel has a module that includes its own computer, such as the Zeiss Multimode plate reader, the same monitor is used for both computers. You can switch the monitor display between the two computers.

To switch the monitor display between two computers:

1. Press the SCROLL LOCK key on the keyboard twice.

3 Performing a Run

This chapter describes how to start the BioCel® and run an existing protocol. All of the procedures in this chapter can be performed by someone with Operator privileges.

Workflow Overview

Workflow Steps

The general workflow for starting the BioCel and performing a run is given in the following table:

Step	Procedure	See...
1.	Start the BioCel	“Turning On the BioCel” on page 41
2.	Log in to the operating system	“Logging in To the Operating System” on page 44
3.	Start VWorks™	“Starting VWorks” on page 45
4.	Log in to VWorks	“Logging in To VWorks” on page 46
5.	Open a protocol	“Opening a Protocol” on page 51
6.	Optionally, set environmental control alarms and save the protocol	“Adding an Environmental Control Alarm (Optional)” on page 52
7.	Optionally, set general options	“Setting General Options (Optional)” on page 54
8.	Optionally, set error options	“Setting Error Options (Optional)” on page 57
9.	Optionally, set log options	“Setting Log File Options (Optional)” on page 62
10.	Understand the protocol so you know how to proceed	“Understanding the Protocol” on page 64
11.	Prepare each module	“Preparing Modules and Accessories” on page 66
12.	Perform final checks	“Performing Pre-Run Checks” on page 76
13.	Start the run	“Starting a Run” on page 78
14.	Monitor the run	“Monitoring a Run” on page 83
15.	Clean up after the run	“Performing Post-Run Clean-Up” on page 90
16.	Shut down the BioCel	“Shutting Down the BioCel” on page 92

Turning On the BioCel

When To Use

If your BioCel is not already on, starting it is the first step.

Procedure

To better understand what is happening as you turn on the BioCel, you may want to refer to the description of the "Power System" on page 30.

To turn on the BioCel:

1. Make sure that the main power line, air line, vacuum line (optional) and Ethernet cable (optional) are plugged in, as shown in "External Connections" on page 25.
2. Make sure that any external drains and water lines are attached.
3. On the power panel, turn the main power switch to the On position.

   When you do this, the main power indicator light on the power panel remains off and this action does not appear to do anything. This is correct. For a diagram, see "Power Panel" on page 26.
4. Open side door 2.

   For more information about door numbering, see "Side-Door Numbering" on page 28.
5. Push the UPS (uninterruptible power supply) power button to allow the UPS to supply electricity.

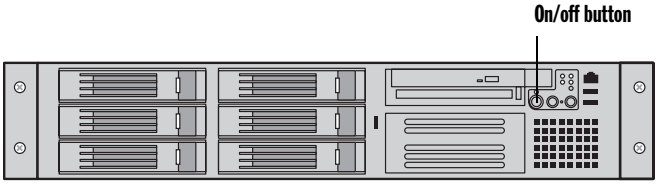
   The UPS LEDs illuminate to indicate the UPS power status.

   If you have more than one UPS on your BioCel, make sure you turn them all on. The UPSs are connected in series, so turn on the UPS that is connected to the main power first followed by the remaining UPSs in the order in which they are connected together.

   For more information about operation of the UPS and meaning of the status lights, see the third-party UPS documentation provided with your BioCel.
6. Turn on the DC power supply switches labelled Robot and System, as shown in "Main Hardware Components" on page 28.

   The switch lights turn on.
7. Check that the lights on the Ethernet and RS-232 communication hubs are on.

   Refer to "Main Hardware Components" on page 28 for a diagram.
8. If the monitor is off, turn it on.
9. Push the computer on/off button to start the computer.



The computer performs self-tests, starts the operating system, and opens the **Welcome to Windows screen**.

10. Close door 2.

    See "General Hazard Warnings" on page 19 for injury hazards associated with the BioCel side doors.

11. Make sure that the emergency stop button on the power panel and the emergency stop buttons on the tabletop are in the out position.

    For more information about emergency stops, see "Pausing, Stopping and Aborting a Run" on page 80.

12. Close the overhead doors.

    See "General Hazard Warnings" on page 19 for damage and injury hazards associated with the BioCel overhead doors.

13. On the power panel:

    a. Check that the interlock light is on.

       This indicates that the overhead doors are closed.

    b. Press the reset button and check that its indicator light is on.

       This resets the emergency stop circuit.

    c. Turn the air knob counterclockwise and check that the indicator light is on.

       This turns on air to the modules.

14. If you use modules or devices that require a vacuum created by a vacuum pump:

    a. Check that the gauge on the vacuum pump indicates a vacuum pressure.

    b. Make sure that the vacuum system is connected correctly.

       For more information, see "Vacuum System" on page 34.

15. Make sure that all four lights on the power panel are on.

    For more information, see "Power Panel" on page 26.

Note: The air pressure is sensed automatically and should not need to be checked before every run. For your reference the normal operating pressures are 90–100 psi for the main regulator and 40–50 psi for the robot regulator. See "Air Panel" on page 29 for a diagram that shows the locations of the regulators.

The BioCel Ready State

Ready State Conditions

When the BioCel is on and ready to run:

- ❑ The status lights are off.

  For more information about the status lights, see "Monitoring a Run" on page 83.

- ❑ All devices are on and pneumatic devices are supplied with air.

  For more information about devices, see "Managing Devices" on page 135.

- ❑ The computer is on and ready for a user to log in to the operating system.

- ❑ The UPSs are charged, ready to provide battery backup if the main AC power supply is cut.

  See your third-party UPS user manual for more information.

- ❑ All doors are closed.

- ❑ The interlock override is off so that opening an overhead door or pressing an emergency button will activate the emergency stop circuit.

Logging in To the Operating System

When To Use

Log in to the Windows® operating system on the computer after following the directions in "Turning On the BioCel" on page 41.

Procedure

To Log in to the Windows operating system:

1. At the **Welcome to Windows** screen, press CTRL + ALT + DELETE.
2. At the **Log On to Windows** screen, type your User name and Password.
3. If necessary, in the **Log on to** text box, type the name of the network domain to which to which your BioCel is connected.

   Contact your network administrator if you do not know your network domain name. You should only need to type in this name once.
4. Click **OK**.

Starting VWorks

When To Use

Start VWorks after logging in to the Windows® operating system, as described in "Logging in To the Operating System" on page 44.

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

Starting VWorks

To start VWorks:

1. Make sure that everyone is clear of the table and there are no objects on the table that could obstruct the robot.

   !! INJURY HAZARD !! When VWorks starts, the robot and module parts may move as they home.

2. Open the folder c:\vworks workspace.
3. Double-click the shortcut to VWorks2.exe.

   This starts VWorks, loads configuration databases, checks for communication with modules and initializes installed devices.

   If you receive an error at this point, refer to "Maintenance and Troubleshooting" on page 189.

Logging in To VWorks

User Account

To log in to VWorks you need a VWorks user account, created by an administrator. For more information about user accounts, see "User Accounts and Privileges" on page 47.

Logging In

To log in to VWorks:

1. Click the **Log In** button.
2. Select your account user name from the list box.
3. Type your password and click **OK**.

Changing Your User Account Password

You can change the password for your user account at any time.

To change your VWorks user account password:

1. Click the **Log In** button.
2. Select your account user name from the list box.
3. Click the **Change Password** button.
4. In the **Change Password** dialog box:
   a. Type your old password in the **Old** text box.
   b. Type your new password in the **New** text box.
   c. Type your new password again in the **Confirm New** text box.
   d. Click **OK** to close all dialog boxes.

User Accounts and Privileges

Introduction

You must have a user account to log in to VWorks software. Your user account is associated with a user role that determines the privileges you have to perform particular functions within the software.

If you are an administrator and need to know how to create a user account, see "Creating a User Account" on page 158.

The Effect of Privileges

If you do not have the privilege to perform a function associated with a particular menu command, the text of the command is gray.

If you do not have the privilege to perform functions associated with a tabbed page, the tab is not visible to you.

In some cases, if you do not have the privilege to perform an operation, when you attempt the operation you will get an error message telling you that your privileges are insufficient.

User Roles and Privileges

VWorks user roles enforce the following privileges:

User Role	Has Privileges To...
Velocity11®	Perform any function, including managing devices through the VWorks™ device manager. Used primarily by Velocity11 personnel, but occasionally needed by BioCel administrators, such as when configuring devices.
Administrator	Perform Technician functions (see below).
	Create and delete user accounts.
	Manage devices using Active X commands and the BioCel Diagnostics window.
Technician	Perform Operator functions (see below).
	Create and save protocols.
Operator	Perform Guest functions (see below).
Guest	Run, but not save, existing protocols.

About Tasks, Processes and Protocols

Introduction

Before you can understand or create protocols, you need to know the meanings of the terms defined in this section.

Plate Instance Defined

A plate instance represents the basic information about a plate or collection of plates and is the first icon in a process displayed in the process editor. The information it represents includes the type of labware used in the process, how many plates are available for processing at one time, whether the plates have lids, and so on.

The following example icon represents a plate instance for a tipbox.

For information about creating a plate instance, see "Setting Up a Plate Instance" on page 96.

Task Defined

A task is an operation that is performed on one or more plates and is represented by an icon in the process editor. It has associated parameters that are defined in the Task Parameters toolbar.

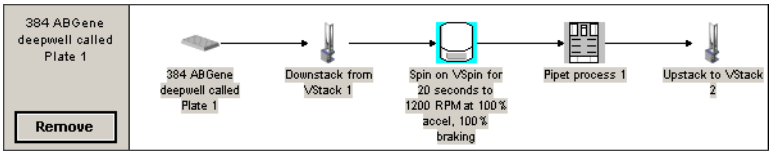
The following example icon represents a task for upstacking or downstacking plates.

Note: A task is similar to, but not identical to, a pipette task.

Process Defined

A process is a sequence of tasks that are performed on a plate instance.

The following diagram shows a process with one plate instance icon and four task icons.



Note: A process is similar to, but not identical to, a pipette process.

How a Plate Instance and Task Differ

Although the icon for a plate instance looks like a task icon its function is different because it does not represent an action in a protocol. This distinction becomes important when you are interpreting error messages. Consider the following example:

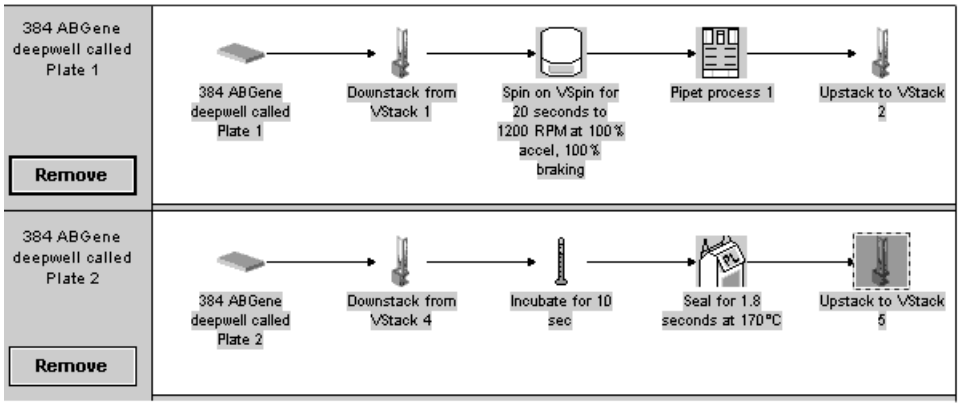
Error in Test, task 2: Pipette process 1 is required to process Test but does not

This error refers to task 2, which is the Pipette Process task in the following diagram, and not the Downstack task. The first icon is the plate instance.

Protocol Defined

A protocol is a collection of processes that run at the same time, as defined in the process editor.

The following diagram shows one protocol with two processes.


384 ABGene deepwell called Plate 1
Remove
384 ABGene deepwell called Plate 1
Downstack from VStack 1
Spin on VSpin for 20 seconds to 1200 RPM at 100% accel, 100% braking
Pipet process 1
Upstack to VStack 2
384 ABGene deepwell called Plate 2
Remove
384 ABGene deepwell called Plate 2
Downstack from VStack 4
Incubate for 10 sec
Seal for 1.8 seconds at 170°C
Upstack to VStack 5

Pipette Process Task Defined

A Pipette Process task is the parent of a sequence of Pipette tasks that perform liquid handling procedures using a VPrep® module. A Pipette process is sufficiently complex that it has to be defined by a group of separate sub-tasks, each with its own parameters.

An icon for a pipette process task is shown below.

Pipette Process Link Icon

The pipette process link icon is always the first icon in a pipette process. The icon performs a similar function to a plate instance in that it does not represent a task itself and is the first icon in a protocol. However, the pipette process link icon only has one parameter, and it is used to link a pipette process task in the protocol editor to a pipette process in the pipette process editor.

Pipette Task Defined

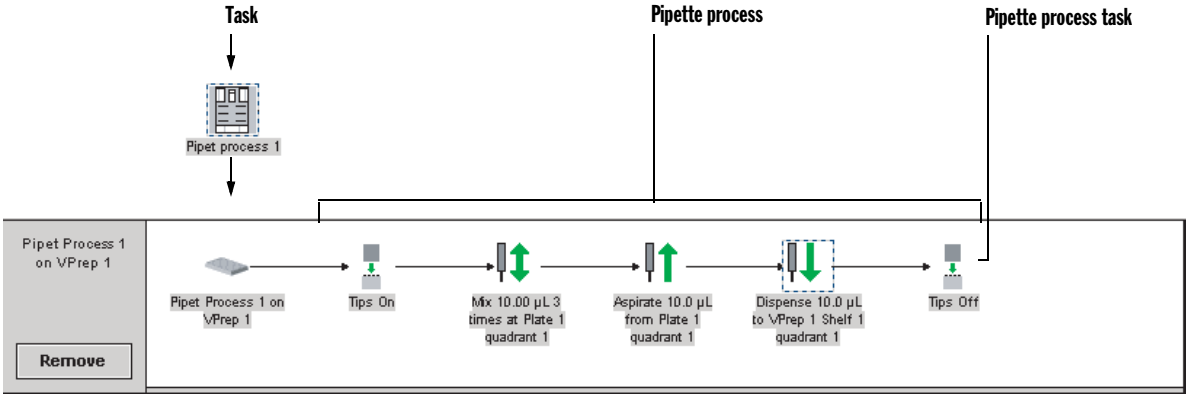
A pipette task is an operation that is performed on one or more plates by a VPrep. It is represented by an icon in the pipette process editor.

The following diagram shows a pipette task.

Pipette Process Defined

A pipette process is a sequence of pipette tasks that a specific plate performs, as defined in the process editor. It is a subroutine of a pipette process task.

The following diagram describes the relationship between a task, pipette process task and a pipette process.


Task
Pipette process
Pipette process task
Pipet process 1
Pipet Process 1 on VPrep 1
Remove
Pipet Process 1 on VPrep 1
Tips On
Mix 10.00 µL 3 times at Plate 1 quadrant 1
Aspirate 10.0 µL from Plate 1 quadrant 1
Dispense 10.0 µL to VPrep 1 Shelf 1 quadrant 1
Tips Off

Run Defined

A run is a single protocol that is run one or more times in a series.

When you start a run, you are prompted to enter the number of plates that you want to run. The value that you enter represents the number of times the protocol executes before the run ends. For example, a value of four means that the protocol will run four times in the series.

Opening a Protocol

About Protocol Files

All of the configuration settings associated with a protocol are stored as a protocol file in a folder determined by an administrator. Protocol files use the naming convention <*filename*>.bio.

For more information about the data stored in a protocol, see "Understanding the Structure of Configuration Settings in a Pipette Task" on page 130.

For definitions of protocol and related terms, see "About Tasks, Processes and Protocols" on page 48.

Instructions for creating a protocol are given in "About Creating Protocols" on page 94.

When To Use

Use the procedure in this section to open a protocol that has already been created.

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

Procedure

To open a protocol:

1. Select **File** > **Open**.
2. Navigate to the folder containing the protocol file you want.

   The default folder is c:\vworks workspace\protocols, but this may have been changed by an administrator.
3. Select the protocol file and click **OK**.

You can also open a protocol by navigating to the .bio file in Windows and double-clicking it. This will launch VWorks™ and open the protocol.

Adding an Environmental Control Alarm (Optional)

Introduction

If your BioCel is equipped with the ability to control the temperature and humidity, you may want to add an environmental control alarm. The alarm opens an error message and optionally creates a sound when an environmental measurement falls outside the range that you specify.

The alarm settings described in "Setting Error Options (Optional)" on page 57 determine the behavior of the alarm.

Additional Information

Temperature and humidity are recorded in a log file. For more information about this log file, see "Environment.txt" on page 61.

For more information about environmental control, see "Using iSeries Diagnostics Software" on page 185.

When To Use

Use the procedure in this section after starting VWorks but before opening a protocol.

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

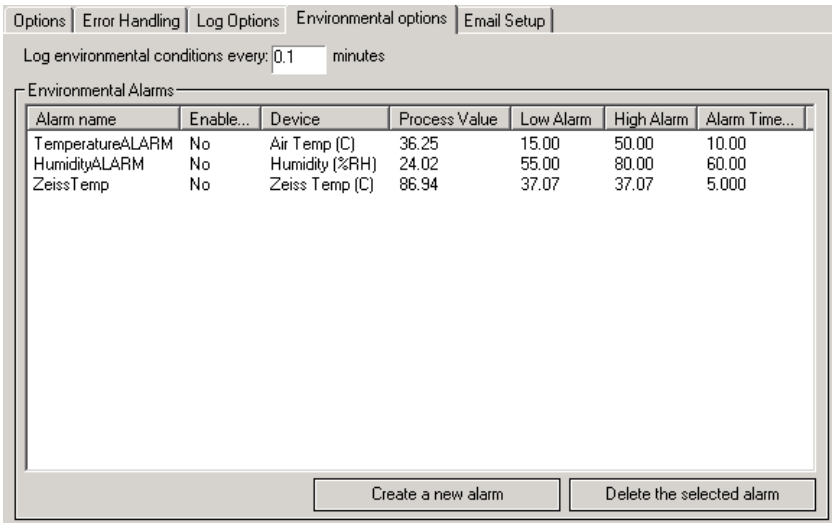
Procedure

Before you can use environmental control, you must first turn on the environmental control option. For more information, see "Setting General Options (Optional)" on page 54.

!! IMPORTANT !! Although it is possible to change environmental control settings directly using the iSeries controllers, we recommend that you do not do this. Attempting to make changes when VWorks is communicating with the iSeries controllers may corrupt data.

To add an environmental control alarm:

1. Select **Tools > Options**.
2. In the **VWorks Options** dialog box, click the **Environmental Options** tab.



3. In the **Log environmental conditions every** text box, type in the time interval between temperature and humidity measurements recorded by the BioCel.

   If you change this value, the existing time interval instance will expire before the change is implemented. If the existing time interval is long and you want to implement the change as soon as possible, you will need to restart VWorks.

4. Click the **Create a new alarm** button.
5. Type a name for alarm in the **Alarm** name field.
6. Click in the **Enable?** column.
7. Click a second time in the **Enable?** column and select **yes** from the list box.
8. In the **Device** column, select the device that you want to set the alarm on from the list box.
9. In the **Low Alarm** column, type the low value at which you want the alarm to be registered.
10. In the **High Alarm** column, type the high value at which you want the alarm to be registered.
11. In the **Alarm trigger time** column, set the time interval between the alarm being registered and the alarm being activated.

    For example, if the temperature **High Alarm** for the table is 40 ºC and the **Alarm trigger time** is 5 min, the alarm is triggered five minutes after the table reaches 40 ºC.

For information about monitoring environmental conditions during a run, see "Monitoring a Run" on page 83.

Setting General Options (Optional)

Introduction

General options include:

- ❑ General device settings
- ❑ The location of the bar code data file
- ❑ A maximum robot speed option
- ❑ A task icon visibility option

For a definition of device, see "Managing Devices" on page 135.

For more information about using bar code data files, see "Setting Bar Code Task Parameters" on page 108.

When To Use

Review general options after you open a protocol but before starting a run. You may not need to do this for every run.

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

Procedure

You may decide to keep all or many of the options the same for every run. If you use bar code data files, though, remember to select the correct file for every run.

To set general options:

1. Select **Tools** > **Options**.
2. Make sure that the **Options** page of the **VWorks Options** dialog box is selected.
3. In the **Device Settings** group box, select from the following options:

Option	When selected...
Check positions for plates before every run...	The robot will check each accessible plate position for the presence of a plate at the start of a run. If it detects a plate where there should not be one, or if there is no plate where there should be one, an alert message will open. This option can prevent the robot from crashing when it tries to place a plate in a position that is already occupied.
Check for minimum air pressure	The system air pressure is continuously monitored. If the pressure falls below the value specified in the text box, an error is generated. The units of pressure specified in the text box are pounds per square inch.

Option	When selected...
Enable BioIO on COM port...	The Bio I/O functions work. The COM port text box identifies the communications port to which the Bio I/O serial cable is connected. You should not need to change this number.
Check waste receptacle on BioIO...	The waste-fill sensor is activated, if your BioCel has one. The input text box specifies the number of the Bio I/O input port to which the sensor is connected. The selected high or low radio button determines whether a high or low signal from the sensor corresponds to a full waste bin. You should not need to change these settings.
Enable environmental control	Allows the BioCel to read data from iSeries environmental control systems. For more information about environmental control, see "Adding an Environmental Control Alarm (Optional)" on page 52.

4. If you are using a bar code data file, select its location:
   a. In the **Bar Code Settings** group box, click the ellipsis button.

   b. In the browse box, navigate to the folder that contains the bar code data file.
   c. Select the file (with a .bar filename extension) and click **Open**.
5. In the **Robot Settings** group box, select the maximum speed of the robot movement.

   !! DAMAGE HAZARD !! If you are testing a new protocol or learning to use the BioCel, run the robot at a slow or medium speed to reduce the risk of damage in the event of a crash.
6. In the **UPS Settings** group box, select from the following options:

Option	When selected...
Use UPS on COM...	Identifies the communications port to which the UPS serial cable is connected. If more than one UPS is connected, it identifies the port for the primary UPS. You should not need to change this number.

Option	When selected...
Use additional UPS on COM...	Identifies the communications port to which a secondary UPS serial cable is connected. You should not need to change this number.
Halt scheduler when battery level drops below...	The scheduler stops scheduling tasks when the battery power falls below the percentage specified in the text box. In BioCels with two UPSs, the value in this text box should be half of the value you would use with a single UPS. For example, if you want the scheduler to stop when the battery power drops below 80% of the total available power, type `40` into this text box.
Power down system when battery level falls below critical power level	When the battery power falls below the level specified in this text box, the BioCel and computer are powered down.
UPS diags	Provides information about the primary UPS, including the source of power, UPS temperature, remaining charge and power draw.
UPS2 diags	Provides information about a secondary UPS, including the source of power, UPS temperature, remaining charge and power draw.
Additionally power down this remote system	Allows a remote computer, such as that used by a Zeiss reader, to be shut down in the event of a power outage

7. If you want to hide task icons that are not relevant to your BioCel module configuration, select the check box in the **Protocol Editor Settings** group box.

   This makes it easier to locate and drag task icons when creating a protocol.

8. Click **OK** to close the **VWorks Options** dialog box.

Setting Error Options (Optional)

Introduction

Error options include:

- ❑ Error reporting options
- ❑ Error handling options
- ❑ Scheduler error behavior options

When To Use

Review error options after you open a protocol and review general options, but before starting a run. You may not need to do this for ever run.

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

Procedure

You may decide to keep all or many of the options the same for every run.

To set error options:

1. Select **Tools** > **Options**.
2. Click the **Error Handling** tab of the **VWorks Options** dialog box.
3. In the **Error reporting** group box, select the modules for which you want to report errors.

   Typically, all of the modules are selected for a run. If you want to perform a test run without plates, clear the options for modules used in the protocol that would otherwise report errors.
4. Select from the following options in the **Error handling** group box:

Option	When checked...
Sound alarm on output...	An alarm will sound in the event of an error. The number in the text box refers to the connection on the Bio I/O console to which the alarm is connected. You should not need to change this number.
Send Email when errors occur	The people listed in the Email tab of the **VWorks Options** dialog box will receive an email for every error notification. For more information, see "Notification of Errors by Pager Or Email" on page 87.

Option	When checked...
Halt on barcode misreads	The robot will complete currently scheduled steps and then stop. The type of error that causes this is a bar code misread. For general information about bar codes, see "Setting Bar Code Task Parameters" on page 108. For more information about bar code misreads, see "Types of Bar Code Misread Error" on page 200.
Launch program if error occurs...	A program that you specify is launched. You must specify the program by clicking the ellipsis button (...) and browsing to the program's executable. With the appropriate script, this function can be used to send a page or an email. If you want to pass the text of the error message to the program, select the Add error text as command line argument check box.
Halt if available disk space...	The robot will complete the currently scheduled step and then stop if the percentage of available hard disk space is less than the percentage specified in the text box.

5. In the **Scheduler error behavior** group box, select one of the following options:

Option	When selected, in the event of an error...
Process as many plates as possible	As many tasks as possible, given the error, will be completed.
Continue processing without starting any new plates	Tasks involving plates that are currently available to the robot will continue. Other tasks will not be scheduled.
Stop scheduler	The scheduler will stop scheduling new tasks, even if plates are currently available to the robot. The current task continues to completion.

6. Click **OK** to close the **VWorks Options** dialog box.

About Log and Output Options

Introduction

This section describes the different types of logs that the BioCel creates.

Types of Log Files

Log files record event and error information in text files that can be useful for troubleshooting.

There are four log files, which have the following default filenames:

- log.txt
- piplog.txt
- barcodelog.txt
- environment.txt

You can change these filenames to suit your own needs, but they are referred to using their default names throughout this guide.

Log.txt

The log.txt file is the process log that records all available event and error information. The information recorded in the process log cannot be modified.

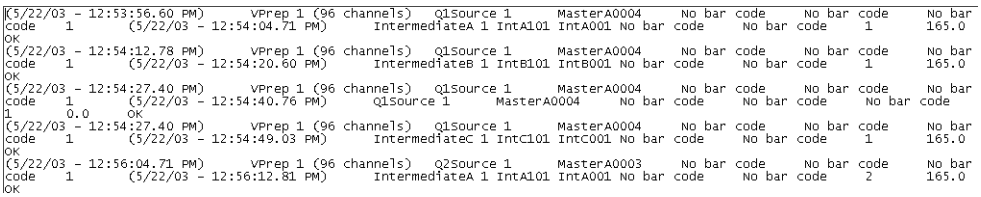
Part of a process log, opened in WordPad, is shown in the following diagram.

```
(5/22/03 - 12:52:42.60 PM)    Info  Scheduler         20 Q3TipBoxs at VStack 12 required
(5/22/03 - 12:52:42.60 PM)    Info  Scheduler         20 Q4TipBoxs at VStack 12 required
(5/22/03 - 12:52:42.60 PM)    Info  Scheduler         20 IntermediateBs at VStack 4 required
(5/22/03 - 12:52:42.60 PM)    Info  Scheduler         20 IntermediateCs at VStack 4 required
(5/22/03 - 12:52:42.62 PM)    User  velocity11        Starting protocol
(5/22/03 - 12:52:42.65 PM)    Event VStack 4    IntermediateA 1   Downstack 384 ABGene deepwell
(5/22/03 - 12:52:42.93 PM)    Event VStack 1    Q1Source 1 (bar code No bar code)   Downstack 96 Matrix tube rack
(5/22/03 - 12:52:43.23 PM)    Event VStack 16   Q1TipBox 1  Downstack V11 Tip Box 96d200
(5/22/03 - 12:52:44.04 PM)    Event VPrep 1           Starting pipette process 1
(5/22/03 - 12:52:45.40 PM)    Event VStack 4    IntermediateA 1   Downstack complete
(5/22/03 - 12:52:45.46 PM)    Event VCode IntermediateA 1   Apply label
(5/22/03 - 12:52:45.48 PM)    Event Robot IntermediateA 1   Fetching plate from VStack 4 and placing at VCode
(5/22/03 - 12:52:46.06 PM)    Event VStack 16   Q1TipBox 1  Downstack complete
(5/22/03 - 12:52:46.29 PM)    Event VStack 1    Q1Source 1 (bar code No bar code)   Downstack complete
```

During a run, you can type notes that are added to this log file. For more information, see "Working with the Log Toolbar" on page 88.

Piplog.txt

The piplog.txt log file contains VPrep pipetting information. This log is not the same as the log generated by the VPrep.



```
(5/22/03 - 12:53:56.60 PM)      VPrep 1 (96 channels)   Q1Source 1      MasterA0004     No bar code     No bar code     No bar
code    1       (5/22/03 - 12:54:04.71 PM)      IntermediateA 1 IntA101 IntA001 No bar code     No bar code     1       165.0
OK
(5/22/03 - 12:54:12.78 PM)      VPrep 1 (96 channels)   Q1Source 1      MasterA0004     No bar code     No bar code     No bar
code    1       (5/22/03 - 12:54:20.60 PM)      IntermediateB 1 IntB101 IntB001 No bar code     No bar code     1       165.0
OK
(5/22/03 - 12:54:27.40 PM)      VPrep 1 (96 channels)   Q1Source 1      MasterA0004     No bar code     No bar code     No bar
code    1       (5/22/03 - 12:54:40.76 PM)      Q1Source 1      MasterA0004     No bar code     No bar code     No bar code
1       0.0     OK
(5/22/03 - 12:54:27.40 PM)      VPrep 1 (96 channels)   Q1Source 1      MasterA0004     No bar code     No bar code     No bar
code    1       (5/22/03 - 12:54:49.03 PM)      IntermediateC 1 IntC101 IntC001 No bar code     No bar code     1       165.0
OK
(5/22/03 - 12:56:04.71 PM)      VPrep 1 (96 channels)   Q2Source 1      MasterA0003     No bar code     No bar code     No bar
code    1       (5/22/03 - 12:56:12.81 PM)      IntermediateA 1 IntA101 IntA001 No bar code     No bar code     2       165.0
OK
```

It contains the following information, separated by tabs:

- Aspiration timestamp
- Pipettor name, and number of channels on the head, given in parentheses
- Name of the plate aspirated from
- North bar code
- East bar code
- South bar code
- West bar code
- Quadrant of the plate aspirated from (number 1–16)
- Dispense timestamp
- Name of the plate dispensed to
- North bar code
- East bar code
- South bar code
- West bar code
- Quadrant of the plate dispensed to (number 1–16)
- Volume of liquid dispensed in microliters
- Status of the dispense

  Values are ERROR or OK. These refer to the status of the bar code verification and not the dispense itself.

Note: One piplog entry is created for every dispense task pair. For example, if 20 µL are aspirated and half is dispensed to one plate and half to another plate, two piplog entries are created. This example is treated as two dispense task pairs.

Barcodelog.txt

The barcodelog.txt file contains the date and time at which each bar code is applied, and the text of each field. Bar Code fields are displayed in human readable form.

For more information, see "Setting Bar Code Task Parameters" on page 108.

Environment.txt

The environment.txt log records temperature and humidity readings in BioCel platforms equipped with iSeries environmental control sensors.

```
(6/4/03 - 9:20:37.04 PM) air     humidity       table        zeiss humidity          zeiss temp
(6/4/03 - 9:20:43.06 PM) 27.46   40.06          31.00           52.54                  23.09
(6/4/03 - 9:20:49.06 PM) 27.47   40.04          31.00           52.58                  23.10
```

What is Measured

Your BioCel can be configured to record a variety of measurements, such as:

- ❑ Air temperature
- ❑ Air humidity
- ❑ Table temperature
- ❑ Air temperature inside a custom enclosure
- ❑ Air humidity inside a custom enclosure

Measuring Units

Temperature is recorded in degrees Celsius and humidity is recorded as a relative humidity percentage.

Setting Log File Options (Optional)

Introduction

This section gives a procedure for configuring the log and output options. You may not need to do this for every run.

When To Use

Review log and output options after opening a protocol but before starting a run.

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

Available Options

There are four types of log and data output options:

- ❑ The type of log information to show in the message display pane of VWorks
- ❑ The folder locations in which to store log files
- ❑ General log file settings
- ❑ The folder location in which to store data collected by plate readers

The first three of these options are described in this section. Setting the output folder for plate reader data is described in "Ultramark Plate Reader Data" on page 161.

Message Display Pane

Event and error messages are displayed in the message display pane of the VWorks window. With all message options turned on, a large number of messages are displayed. For ease of use, you can choose to hide types of messages that are not important to you. The messages that are displayed during a run are controlled by:

- ❑ Selecting screen setting options before a run
- ❑ Clicking tabs in the bottom pane during a run

For more information about using the screen log display, see "Working with the Log Toolbar" on page 88.

Note: Screen display settings do not affect the information saved in log files. All error and event information is always saved to log files.

Procedure

To set log file options:

1. Select **Tools** > **Options**.
2. In the **VWorks Options** dialog box, click the **Log Options** tab.
3. In the **Screen settings** group box, select one or more of the following options, as needed:

Log Option	Description
Log “task begin” events on screen	Displays messages at the time that process tasks are scheduled (not at the time that they are performed). This applies only to the log.txt file.
Log “task complete” events on screen	Displays messages that confirm when process tasks are completed. This applies only to the log.txt file.
Log robot motions on screen	Displays robot motion events as they happen. This applies only to the log.txt file.
Log pipette debug messages	Displays event messages that are generated by VPreps. This applies only to the log.txt file.

4. In the **File Settings** group box:
   a. In the **Max number of each log file to maintain** text box, type the maximum number of log files that you want to store.

      After this number has been reached, each new log files replaces the oldest existing log file.

   b. Select one or more of the following options, as needed:

Log Option	Description
Create new logs for every run	A separate log file is created for every run. If the check box is cleared, each run appends data to the same log file. This affects all log files.
Append dates to log filenames	The date and time of the run is appended to the name of the log file. This affects all log files.

   c. Click the ellipsis button for a log file.

   d. Navigate to the folder to which you want to save the log file.
   e. Click **Save**.
5. In the **VWorks Options** dialog box, click **OK**.

Understanding the Protocol

Introduction

If you are not already familiar with the protocol you intend to run you will need to take some time to understand it.

What You Should Know

You should minimally know:

- ❑ Which modules you need to prepare
- ❑ Where you should position the plates before the run and where they are moved to during the run
- ❑ Whether User Message tasks prompt you to perform certain actions after you start the run or whether you must perform the actions before you start the run
- ❑ Whether you will need to replace fluids and empty waste during the run
- ❑ Whether you will need to remove and add plates during the run
- ❑ Which liquids to prepare, where they should be placed and in what kind of reservoir.

Printing a Protocol

It may help you to refer to a printout of the protocol steps as you analyze the protocol.

To print a protocol:

1. Select **File** > **Print**.
2. Select your required options from your printers' print options dialog box.
3. Click **Print**.

An example of a printed process that includes a pipette process is shown here.

384 ABGene deepwell called Test Plate:
Pipet process 1
Incubate for 10 sec
Restack from VStack 12 to VStack 10 over 180 seconds
Downstack from VStack 2

****

Pipet Process 1:
Aspirate 10.0 µL from Test Plate quadrant 1
Dispense 10.0 µL to VPrep 1 Shelf 3 quadrant 1 using 384 Disposable Tip 01ul - 05ul
Mix 10.00 µL 3 times at VPrep 1 Shelf 5 quadrant 1

Note: If you try to print a protocol before a network printer driver is installed on the BioCel computer, you will receive an error. If this happens, contact your network administrator for help.

Preparing Modules and Accessories

Introduction

This section summarizes the procedures used to prepare individual modules and accessories for use on the BioCel.

Note: Do not use this section as a substitute for the manuals for the individual modules. This section is intended for quick reference only.

The procedures in this section assume that the modules are already turned on and that you are familiar with the operation of the individual modules on your BioCel.

For more information about modules, see "BioCel Modules" on page 35. For more information about accessories, see "Optional BioCel Components" on page 36.

When To Use

Prepare modules and accessories after you have become familiar with the protocol.

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

Set Up Order

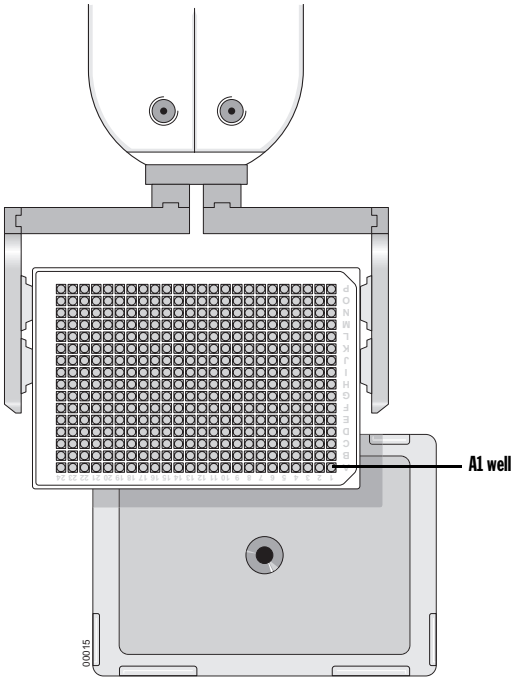
You would typically prepare the BioCel modules and accessories in the order presented in this section. Using this order you first set up modules and accessories that have no time-sensitive elements, and could therefore be set up the night before the run, and leave the more complex preparations, which may require expensive and unstable reagents, until last.

Note: If the protocol includes User Message tasks to prompt you to perform some setup steps, such as placing counterweight plates, don't include these steps in the setup. For more information about User Message tasks, see "Setting User Message Task Parameters" on page 101.

About Placing Plates

Depending on the protocol you intend to run, you may need to manually place plates, tipboxes, reservoirs, or counterweights onto platepads, hotel shelves, Vstack® racks, VSpin™ rotors, or VPrep shelves.

Always place plates so that the A1 well is in the top, left corner, as viewed by the robot.



For more information about placing plates on hotels, see "Placing and Removing Hotel Plates" on page 72.

For more information about setting up counterweights in the VSpin, see "Setting Up a VSpin Counterweight Plate" on page 74.

Waste Bin Set Up

Empty the waste bin and replace it under the waste opening in the BioCel table.

If your BioCel has environmental control, the waste opening has an automatic door which may open or close during a protocol without warning. Make sure that you keep away from the door when removing or replacing the bin. Following the procedures exactly as described below will allow you to do this.

!! INJURY HAZARD !! If your BioCel has environmental control, use caution when removing or replacing the waste bin. If a protocol is running, the automatic door may open or close at any time. Low force is used to open and close the door, so the risk of serious injury is low. However, protect yourself by keeping away from the door mechanism at all times.

To remove the waste bin from its hanger:

1. Open the side door nearest the bin.

2. Hold the bin at the top right corner with your right hand.
3. Lifting the front side of the bin upwards with your right hand, place your left hand underneath at the bottom left corner.
4. Supporting the bin with both hands, lift it up and off the hanger, resting it on the BioCel floor.
5. Slide the bin out of the BioCel.
6. Close the side door.

To replace the waste bin on its hanger:

1. Open the side door nearest the bin.
2. Slide the empty bin into the BioCel until it lies underneath the waste opening, with the side of the bin resting against the hanger.
3. Lifting the front side of the bin upwards with your right hand, place your left hand underneath at the bottom left corner.
4. Using both hands, lift the bin up, over the hanger, and down so the hanger supports the underside of the lip.
5. Close the side doors.

Teleshake Set Up Process

No setup is required for a Teleshake module.

VStack Set Up Process

The general process for loading a VStack with plates for a run is described here. For more detailed procedures, see the *VStack User Manual*.

1. Press the black gripper button to release the bottom plate in the rack.

   A rack must be present in the VStack for the gripper button to work.
2. Remove the rack.
3. Fill with the correct labware.
4. Return the rack to a VStack that will deliver plates, according to the protocol you will run.

   As the racks can be positioned either way round, make sure that the A1 wells of the plates are in the top, left corner, as viewed by the robot.
5. Press the black button to set the gripper.

VCode Set Up Process

The general process for preparing a VCode® for a run is described here. For more detailed procedures, see the *VCode User Manual*.

1. Make sure that there is enough label stock in the label source roll.
2. Make sure that there is enough media stock in the media source roll.
3. If the radius width of the label backing on the take-up roll is more than 1 inch (2.5 cm) wide, remove the label backing from the take-up roll, cut it and reattach the end.

   Too much label backing on the take-up roll can interfere with operation of the VCode.
4. Use VCode diagnostics software to perform test-label a plate.

VSpin Set Up Process

In stand-alone mode, the VSpin can spin two sample plates at the same time. When used on the BioCel, it can spin one sample plate at a time and always requires a counterweight plate.

The counterweight can be added manually or robotically.

1. If you are using a manually-loaded centrifuge counterweight, place the counterweight into bucket 2, using VSpin diagnostics software to open and close the VSpin door.
2. If you are using robot-loaded counterweights, make sure you have correctly set up counterweights in VWorks and placed the counterweights in the correct plate positions.

   For more information about setting up counterweights, see "Setting Up a VSpin Counterweight Plate" on page 74.

!! DAMAGE HAZARD !! **To avoid a robot crash, always place the counterweight into bucket 2 and leave the door open with bucket 1 at the front. The sample plate will always be moved to bucket 1 by the robot.**

For more detailed information about manual operation of the VSpin, see the *VSpin User Manual*.

UltraMark Set Up Process

The general process for preparing an UltraMark for a run is described here. For more detailed procedures, see the documentation that accompanies the UltraMark.

1. Make sure that the plate carrier is in the out position.
2. Make sure that the correct filter set is used.

Spectrafluor Set Up Process

The general process for preparing a Spectrafluor for a run is described here. For more detailed procedures, see the documentation that accompanies the Spectrafluor.

1. Make sure that the plate carrier is in the out position.
2. Make sure that the correct filter set is used.

Bio-Tek Washer Set Up Process

The general process for preparing a Bio-Tek washer ELx405 for a run is described here. For more detailed procedures, see the documentation that accompanies the Bio-Tek washer.

1. Empty the waste container.
2. Fill the source reservoir.
3. Make sure that the vacuum to the washer is set up.
4. Prime the washer, either manually or using the diagnostics software from the BioCel.
5. Press the Main Menu button to return the Bio-Tek Washer display console to the main menu.

!! IMPORTANT !! If you do not do this, the protocol will not run.

!! IMPORTANT !! Do not use any of the Bio-Tek Washer sensors. The sensor information interferes with the Velocity11 diagnostics software.

Q Fill2 Set Up Process

The general process for preparing a QFill2 for a run is described here. For more detailed procedures, see the QFill2 user manual.

1. Fill the dispensing bottle with the liquid you want to use.
2. Connect the tubing.
3. Press the Purge button to prime the tubing with liquid.
4. Return to the main screen on the QFill2.
5. Make sure that the correct manifold is installed for the type of plate you are using.

   Different manifolds dispense to different numbers of wells.

Multidrop Set Up Process

The general process for preparing a Multidrop for a run is described here. For more detailed procedures, see the documentation that accompanies the product.

1. Set up the reagents.
2. Make sure that the dispense manifold is installed.
3. Prime the head to remove bubbles.

Zeiss Reader Set Up Process

For information about setting up a Zeiss Reader, see the user documentation that accompanies the reader.

VPrep Set Up Process

The general process for preparing a VPrep for a run is described here. For more detailed procedures, see the *VPrep User Manual*.

Note: On the BioCel, the robot has access to VPrep shelves 2, 4, 6 and 8, meaning that only these shelves can hold sample plates. Shelves 1, 3, 5 and 7 are reserved for reservoirs and tipboxes.

1. If you are changing the reagent type in a particular reservoir:
   a. Remove and wash any reservoirs.
   b. Detach and wash reservoir tubing.
   c. Replace the tubing and reinstall the reservoir.
   d. Remove and wash any MicroWash trays.
   e. Detach and wash MicroWash tray tubing.
   f. Replace the tubing and reinstall the tray.
2. Make sure that the reservoir and tray tubing allows the shelves to move to their fully engaged position.
3. Install tubing into the correct pumps.
4. Fill the fluid reservoir bottle that is located on the lower deck of the BioCel, replace the cap, and attach the fluid line to the cap connector.

   Make sure you attach the fluid line that pumps towards the VPrep.
5. Empty the waste container located on the lower deck of the BioCel, replace the cap and attach the fluid line to the cap connector.

   Make sure that you attach the fluid line that pumps away from the VPrep.
6. Use the VPrep diagnostics software to prime the fluid lines between the pump and VPrep reservoirs by filling the lines with the appropriate fluid.
7. Calibrate the WeighShelf if:
   - You are changing the liquid type used in the reservoir on the WeighShelf
   - The pump module connected to the WeighShelf has been turned off.
   - If you haven't calibrated it for a while.
8. If you are using disposable tips, you may need to attach them before starting the run. If so:
   a. Place a tipbox on the tipbox shelf.
   b. Use the VPrep diagnostics software to install the tips.
   c. Remove the tipbox.

   Attaching tips is an important step. Please refer to the *VPrep User Manual* for more information.

Placing and Removing Hotel Plates

Introduction

You can place plates into a plate hotel and remove plates from a plate hotel by:

- ❑ Removing the hotel from the table or shelf first
- ❑ Leaving the hotel on the table and removing its back plate

In general, it is better to add and remove plates while leaving the hotels in place. Doing it this way you are less likely to spill liquids in the plate wells, and it will reduce wear on the registration pins and hotel bases.

For a general description of plate hotels, see "Plate Hotel" on page 36.

For a description of how to orient plates, see "About Placing Plates" on page 67.

Removing and Replacing a Hotel Back Plate

To remove a hotel back plate:

1. Gently pull up the back plate until it is released.
2. If the back plate locking levers are preventing the back plate from moving, using both thumbs, pull the locking levers out and try again.

To replace a hotel back plate:

1. Hold the back plate vertically.
2. Place the tips of two fingers underneath the back plate and pivot the top towards you to an angle of approximately 45 degrees.
3. Align the bottom phalanges of the back plate with the cutouts on the hotel body and pivot upwards, making sure the phalanges fit squarely in the cutouts.
4. Align the top phalanges of the back plate with the cutouts on the hotel body and push the back plate in so it is vertical.
5. Drop the back plate down.
6. Press in the locking levers.

Removing and Replacing a Hotel

To remove a plate hotel:

1. With one hand, reach over the top of the hotel and grab the far edge of the handle.
2. Place a finger from your other hand through the back plate and gently press upwards on the third or fourth shelf from the bottom.
3. Distributing the weight between both hands, lift the hotel vertically off the two registration pins that position the hotel on the BioCel table or shelf, and place it on a bench.
4. Turn the hotel so the front is facing you, and add or remove plates as needed.

To replace a plate hotel:

1. On the lab bench, turn the hotel so its back is facing you.
2. Reach over the top of the hotel and grab the far edge of the handle.
3. Place a finger from your other hand through the back plate and gently press upwards on the third or fourth shelf from the bottom.
4. Distributing the weight between both hands, carry the hotel to the BioCel table or shelf.
5. Look down through the gap in the back plate to the floor of the hotel.
6. Looking through the hole in the hotel floor, locate the registration pin and move the hotel so the pin lies above the hole.
7. Swivel the hotel slightly from side to side until the far registration pin locates its hole.

   !! DAMAGE HAZARD !! Do not place weight on the registration pin as you do this to reduce the risk of damaging the hotel base.
8. Slowly lower the hotel onto the pins.

Setting Up a VSpin Counterweight Plate

Introduction

A counterweight plate is always required to balance sample plates when centrifuging in a VSpin module on a BioCel. A counterweight plate is the same as a sample plate except that it is empty, or contains water to provide a more accurate balance. If a counterweight is not used, a load imbalance error will result. The load imbalance tolerance is 10 grams.

Using a counterweight plate and spinning one sample plate at a time does not typically increase the length of a protocol run, compared to spinning two sample plates at a time. This is because the centrifuge task is not typically the time-limiting step of a protocol.

Options For Loading Plates

If three different types of plates are centrifuged during a protocol, three different counterweights are required.

You can load counterweights into a VSpin:

- ❑ By hand, using VSpin Diagnostics software to open and close the centrifuge door and move the rotor.
- ❑ With the robot, using a combination of Robot Diagnostics and VSpin Diagnostics.
- ❑ Automatically, using the robot during a normal run.

  Some set up is required by administrators before you can load counterweights robotically.

Manually Loading Counterweights

You can load a counterweight by hand.

To load a counterweight by hand:

1. In VWorks, click **Diagnostics**.
2. Click the VSpin icon.
3. Follow the directions in the *VSpin User Manual* to open the VSpin door and load the counterweight.

   !! DAMAGE HAZARD !! To avoid a robot crash, always place the counterweight into bucket 2 and leave the door open with bucket 1 at the front. The sample plate will always be moved to bucket 1 by the robot.

About Using Robotically Loaded Counterweights

For the robot to be able to load a counterweight:

- ❑ The platepad containing the counterweight must be associated in VWorks with the type of labware used for the counterweight, so the robot knows how to pick it up.

  This association is created by an administrator in the manage counterweights database when creating the protocol. For more information, see “Managing Counterweights” on page 123.

- ❑ The Centrifuge task that uses the counterweight must specify from which platepad to pick up the counterweight.

  This is specified by an administrator when creating the Centrifuge task for the protocol. For more information, see "Setting Centrifuge Task Parameters" on page 124.

- ❑ The counterweight plate must be placed by the operator on the platepad specified in the Centrifuge task.

!! IMPORTANT !! It is the operator's responsibility to make sure that the counterweight on the platepad that the robot will pick up from is of the correct type to balance the sample plate. VWorks does not generate an error if the type of counterweight picked up does not match the type of sample plate.

Note: The administrator who creates a protocol can add user messages to the protocol to remind the operator before a run which types of plate to put on which platepad. For more information about user messages, see "Setting User Message Task Parameters" on page 101.

Setting Up Robotically Loaded Counterweights

The following procedure is for operators only, and where the administrator does not provide information to help the operator set up the counterweights.

To set up robotically loaded counterweights:

1. Identify a process that includes a Centrifuge task and note the type of plate used for the process.
2. In the same process window, click the Centrifuge task in the process.
3. In the **Task Parameters** toolbar, note the platepad defined in the **Select counterweight to use** list box.
4. Repeat the procedure for the remaining Centrifuge tasks in the protocol.

   It may help to create a table that looks like this one, which replicates the relevant information from the manage counterweights database:

Plate Type	Platepad
W	1
X	2
Y	3
Z	4

5. Place the counterweights on the platepads with which they should be associated.

Performing Pre-Run Checks

Introduction

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

Procedure

To check that the BioCel is ready for a run:

1. Make sure that reservoirs and Micro Wash trays are on the correct shelves of the VPrep.
2. Make sure that there are no stray plates in robot-accessible places, which include:
   - Platepads
   - VPrep shelves
   - VSpin buckets
   - VCode plate stages
   - PlateLoc® plate stages
   - Hotel shelves
   - QFill2 plate stages

   As a second check, you can also set the robot to check all accessible positions immediately after starting a run. For more information, see "Setting General Options (Optional)" on page 54.

   !! IMPORTANT !! Leaving a stray plate on the table may cause the robot arm holding a plate to crash into the stray plate. A typical robot crash will damage the plates, lose samples and cut power to the robot. It may also rip off the robot gripper pads.
3. If you are using VSpin counterweight plates, make sure that they are on the correct platepads, according to the protocol you will run, and oriented correctly.
4. Check each stacker to make sure that the labware and plate name listed on the VPrep display panel match the labware and plate name in the stacker and in the protocol.
5. Make sure that the module air pressure lies within the following ranges:

Module	Air Pressure (psi)
PlateLoc	85–90
VCode	85–90
VPrep	90–95
VStack	40–50

6. If your BioCel is equipped with environmental control, check that environmental settings are within acceptable ranges for the run.
7. Close all doors.

!! DAMAGE HAZARD !! **Make sure that you move the computer monitor out of the way as you close the overhead doors. For more information, see** "General Hazard Warnings" on page 19**.**

8. If the interlock override is on, put the key into the interlock override keyhole in the power panel and turn it to the 12 o'clock position.

Starting a Run

When To Use

Start a run after placing plates and reagents on the Biocel.

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

Procedure

To start a run:

1. Make sure that all modules that are used in the protocol are in their home position.

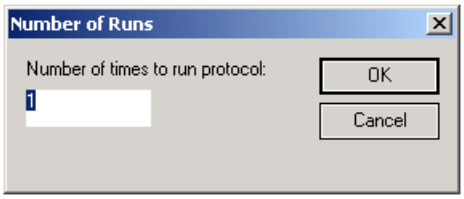
   Refer to the relevant module's user manual for more information about homing.

2. In VWorks, click **Start**.

   At this point VWorks reads the protocol, checks it for inconsistencies and reports any warnings and errors. If there are no protocol compilation errors, the **Number of Runs** dialog box opens. For more information about compilation errors, see "Compilation Warnings and Errors" on page 193.

3. In the **Number of Runs** dialog box, type in the number of times that you want to execute the protocol during the run.

   If your protocol includes a Restack task, this number must be equal to the number of plates you want to restack. For more information, see "Setting Stacker Task Parameters" on page 103.



4. Click **OK**.

   The run starts.

5. If User Message tasks are included in the protocol, you are prompted to respond to them.

   If there are no User Message tasks for this purpose, set laboratory countdown timers for when you need to empty liquid waste containers and refill liquid source bottles.

   For more information about User Message tasks, see "Setting User Message Task Parameters" on page 101.

What Happens After a Run Starts

After you start the run, the following events occur:

- ❑ The Start button becomes unavailable, and the Stop button becomes active.
- ❑ Log messages on the display indicate the start of the run. Also, Log files record events as they are performed on all plates in the Run, according to the selected log file options.

  For more information about log file options, see "Setting Log File Options (Optional)" on page 62.
- ❑ Monitoring of the environment (optional), UPS and disk space begins.
- ❑ If you selected the option for the robot to check all plate positions for plates, this operation will now be performed. If an error is found, correct the problem and click Retry. For more information about this option, see "Setting General Options (Optional)" on page 54.
- ❑ The first instructions of the protocol are executed.
- ❑ If User Message tasks are included in the protocol, you are prompted to respond to them.

  For more information about User Message tasks, see "Setting User Message Task Parameters" on page 101.

Pausing, Stopping and Aborting a Run

Definitions

When you pause a run, the currently scheduled task completes and the protocol can continue later.

When you stop a run, all robot and VPrep motion stops instantly.

When you abort a run, the protocol ends before completion.

Ways To Pause and Stop a Run

You can pause a run by clicking Stop in VWorks.

You can stop a run by:

- ❑ Clicking Stop in VWorks and then aborting the run
- ❑ Pushing an emergency stop button
- ❑ Opening an overhead door

To Routinely Pause Or Stop a Run

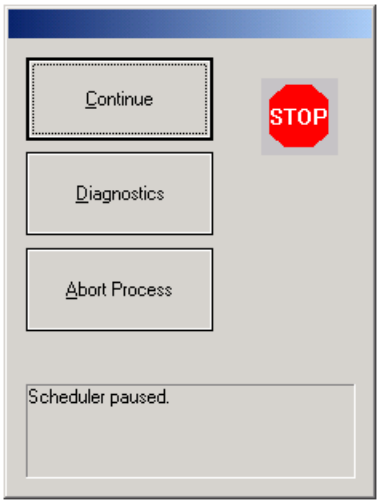
Use this procedure to:

- ❑ Abort a run in a non-emergency situation
- ❑ Pause and continue a run, for example, when you want to:
  - ◆ Add or remove labware
  - ◆ Clean up a spill
  - ◆ Add buffer to a VPrep reservoir
  - ◆ Diagnose a problem that you notice
  - ◆ Perform an operation that is not part of the protocol

To pause or abort a run:

1. In VWorks, click **Stop**.

   The **Stop** dialog box opens and the currently scheduled task continues to completion. This may take a minute or more. After that, no more tasks are performed.



!! INJURY HAZARD !! **Do not open overhead doors until the currently scheduled task is complete.**

2. You now have three choices:

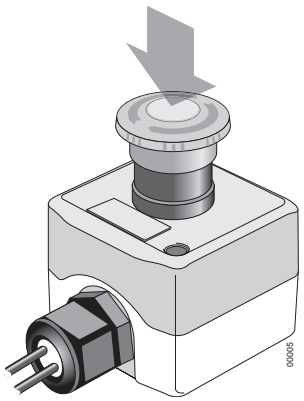
If you want to...	Then...
Continue with the run	click **Continue**.
Troubleshoot a problem or perform a manual operation	click **Diagnostics**, and select the module that caused the error. This opens the diagnostics software for that module, allowing you to troubleshoot the problem.
Abort the protocol	click **Abort Process**.

!! IMPORTANT !! **If you intend to continue with a run, make sure that the system is in a valid state for the protocol. In other words, make sure that you have not made changes that will cause an error, such as moving a plate to a position that should not have a plate, or cause samples to be switched around, such as moving a plate from one stacker to another.**

Using an Emergency Stop Button

In an emergency situation, you can instantly stop all moving parts by pressing an emergency stop button. Emergency stop buttons are located on the table and the power panel.

!! IMPORTANT !! **You cannot continue with a run after using an emergency stop.**



Pressing the emergency button:

- ❑ Stops power to the robot motor
- ❑ Stops power to the VPrep motors that move the head, and activates the break on the head to prevent it from falling
- ❑ Stops power to the modules
- ❑ Stops air being supplied to the modules

To routinely stop a run, use the procedure in "To Routinely Pause Or Stop a Run" on page 80 instead of an emergency stop button.

For information about how the emergency stop circuit works, see "Power System" on page 30.

For information about recovering from an emergency stop, see "Emergency Stop Error Recovery" on page 195.

About Opening an Overhead Door During a Run

Provided the interlock circuit has not been overridden you can open an overhead door at any time during a run to instantly stop BioCel motion. The interlock light on the power panel will turn off when this happens.

When you close the door, a Robot Error dialog box is displayed. For more information about recovering from in interlock error, see "Door Interlock Error Recovery" on page 194.

Do not use the door interlocks to routinely stop a protocol. The door interlocks are designed to be a safety backup system.

For information about how the interlock circuit works, see "Power System" on page 30.

Comparing Interlock and Emergency Circuits

If you lift an overhead door during a run, the run will pause. When you close the door, and click the Continue button in the stop dialog box, the run will resume. If you press an emergency stop button during a run, you will have to perform a more invasive recovery procedure and you cannot continue with the protocol.

The following table shows how different components are affected by the door interlock circuit and emergency stop circuit.

Component	Interlock Cuts?	Emergency Stop Cuts?
Bio I/O power	No	Yes
Cooling fan power	No	Yes
Device power, such as platepad bar code reader	No	Yes
Module power	No	Yes
Robot motor servo power	Yes	Yes
Robot system power	No	No
System air	No	Yes
VPrep motor servo power	Yes	Yes
VPrep pump power	No	Yes

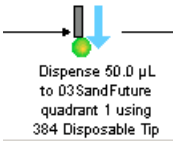
Monitoring a Run

What To Monitor

After starting a run, the operation of the BioCel should be monitored. Exactly what you do to monitor a run depends on the protocol that you are using. For example, you might need to:

- ❑ Compare the motions of the robot to the protocol tasks being completed.

  You can identify the task that is currently being performed from the position of the green ball in the process panes. Because VWorks can schedule more than one task at a time, there may be more than one green ball displayed.



- ❑ Add and remove labware.

  For more information about adding and removing labware during a run, see "Pausing, Stopping and Aborting a Run" on page 80.

  For more information about safety interlocks, see "Power System" on page 30.

- ❑ Empty the waste bin.

  For more information, see "Waste Bin Set Up" on page 67.

- ❑ Empty liquid waste containers.
- ❑ Fill liquid reservoirs.
- ❑ Replace an empty roll of PlateLoc seal or bar code labels.

!! IMPORTANT !! No errors are reported when a liquid waste container becomes full or a liquid reservoir becomes empty. (Exceptions to this are reservoirs on a VPrep WeighShelf or some third-party modules, such as the QFill2.) To guard against the problem of a full waste container or empty reservoir container, the protocol writer can incorporate User Message tasks into the protocol to remind the operator at the appropriate steps in the protocol. Alternatively, operators can set timer alarms to remind them to fill reservoirs and empty a waste containers at the appropriate time.

For more information about User Message tasks see, "Setting User Message Task Parameters" on page 101.

Monitoring Environmental Conditions

If your BioCel is equipped with temperature and humidity controls you can monitor them during the run by:

- ❑ Looking at the digital readouts on the iSeries controllers located behind a side door.
- ❑ Selecting Tools > Options and clicking the Environmental Options tab.

  The Process Value column displays the current value for each alarm that is set.
- ❑ Looking at the digital readout in the iSeries Diagnostics dialog box.

  For more information about iSeries Diagnostics, see "Using iSeries Diagnostics Software" on page 185.
- ❑ Looking at the message display pane at the bottom of VWorks.

  The environmental control values are updated at the time interval specified when setting the alarms. For more information about setting alarms, see "Adding an Environmental Control Alarm (Optional)" on page 52.

Monitoring UPS Status

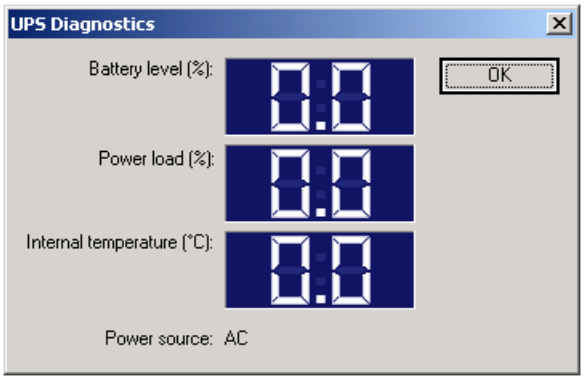
You can monitor UPS status during a run, or at any other time.

To monitor UPS status:

1. Select **Tools > Options**.
2. In the **VWorks Options** dialog box, make sure that the **Options** tab is selected.
3. In the **UPS Settings** group box, click **UPSDiags**.

   If there are two UPSs on your BioCel, you can click **UPS2Diags** for the status of the secondary UPS.

   This opens the **UPS Diagnostics** dialog box.

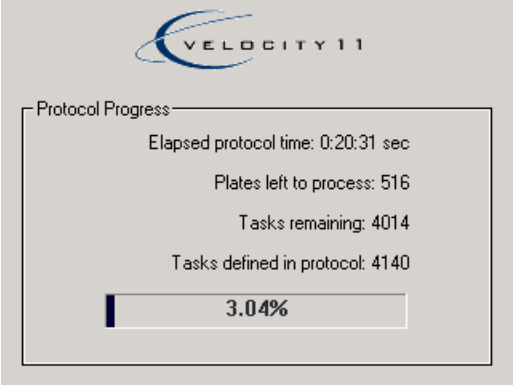


Field	Description
Battery level	Charge in the battery as a percentage of its capacity An alarm will sound if the charge drops below a defined threshold. For information about setting the alarm threshold, see "Setting General Options (Optional)" on page 54.
Power load	Power drawn from the UPS by the BioCel as a percentage of its capacity. An alarm will sound if the power load exceeds 100%.
Internal temperature	Temperature of the battery. For UPS temperature specifications, see the supplied user documentation.

4. Click **OK** to close open dialog boxes.

Monitoring Overall Progress

You can monitor overall progress of the run on the Progress page of VWorks.



Closing Unneeded Toolbars

You can close unneeded toolbars to create more room on the screen for you to monitor a run by clicking the close box.

System Monitoring

What is monitored by the BioCel during a run depends on the options selected for the protocol. Options are:

- ❑ System air pressure
- ❑ Percentage of maximum UPS charge
- ❑ Hard drive space
- ❑ Presence of plates
- ❑ Orientation of plates in stackers
- ❑ Label stock in a VCode
- ❑ Seal stock in a PlateLoc
- ❑ Environmental variables, on systems with environmental control
- ❑ Labware bar codes

  A plate's bar code is read every time it is picked up and then compared to the bar code that VWorks expects for a plate in that position.

Abnormal conditions will generate a warning or error message, change the status light and sound an alarm.

Status Lights

The BioCel status lights give you general information about the status of a run.

Note: The BioCel 1100 model does not have status lights.

Light Pattern	Status
All on solid	Run progressing normally
All off	Not currently running
All blinking	Run error
One light on each post blinking twice, followed by the other light on each post blinking twice	Run progressing normally but with interlock bypass in use
All blinking in circular pattern	Run complete

Notification of Errors by Pager Or Email

You can set up your BioCel so that you are notified of run errors by a page or email.

To set up error notification:

1. Select **Tools** > **Options**.
2. Click the **Email Setup** tab.
3. In the **Error Notifications** group box, click **Add**.
4. Click to select the **New email address** text.
5. Click once more to make the text editable.

   The text is editable when a box appears around it.

6. Type in your full email address.
7. Click **OK**.
8. To remove an email address, click **Remove**.
9. Select the **Send Email when errors occur** option.

   For more information about this option, see "Setting Error Options (Optional)" on page 57.

What To Do When You Get an Error

If you get an error during a run, refer to "Maintenance and Troubleshooting" on page 189 for help.

Working with the Log Toolbar

Log Toolbar

Event and error messages are displayed in the VWorks Log toolbar of the VWorks window.

Viewing the Log Toolbar:

1. From the **View** menu, select **Toolbars > Log**.

   The toolbar opens at the bottom of the screen.

With all message options turned on, a large number of messages are displayed during a run. For ease of use, you can hide types of messages that are not important to you. The messages displayed during a run are controlled by:

- ❑ Selecting screen setting options before a run
- ❑ Clicking tabs at the bottom of the display during a run

For more information about setting screen message options before a run, see "About Log and Output Options" on page 59.

Log Toolbar Options

The following options are available for displaying screen messages.

VWorks Log Tab	Displays...
All	All event and error messages This is the same data that is recorded in the log.txt file.
Process	Event messages, including fluid transfer messages
Fluid Transfers	Event messages reported by VPrep. This is the same data that is recorded in the piplog.txt file, but presented in a sentence format rather than a tab-delimited format. The event messages that are displayed depend on whether the "Record in transfer log" option is selected in the aspirate and dispense pipette task parameters. For more information, see "Setting Aspirate Pipette Task Parameters" on page 138 and "Setting Dispense Pipette Task Parameters" on page 140.
Environmental control	Temperature and humidity measurements.
Errors	Error messages that appear as alert boxes on the screen. This data is not saved in a separate log, but is included in the log.txt file.
Notes	Notes that you add.

Adding a Note

You can type notes into the message display pane during a run. Any notes that you type are also incorporated into the log.txt file.

To add a note to the Log toolbar and log.txt file:

1. At the bottom of the message display pane, click the **Notes** tab.
2. Click in the display pane wherever you want to add the note.
3. Type the note.
4. Press ENTER on the keyboard

   A timestamp is appended to the note.

Performing Post-Run Clean-Up

Background

To see how the procedure in this section fits into the overall process of performing a run, see "Workflow Overview" on page 40.

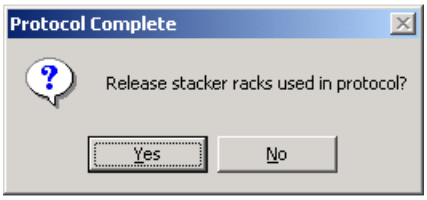
Procedure

To clean up after a run:

1. If the protocol used robotically-loaded counterweight plates, click **Yes** in the message that prompts you to unload the last counterweight that was loaded into the VSpin.

   The robot moves the counterweight plate from the VSpin to the platepad with which the counterweight is associated.

2. Click **OK** in the dialog box that prompts you to release all VStack module grippers.



3. Remove sample plates that have been used.
4. Remove manually placed plates from platepads, hotel shelves, VPrep module shelves, and so on.
5. If necessary, remove the counterbalance plate from any VSpin modules.
6. Wash all items, such as, reservoirs, tubes and manifolds, that were contacted by liquid.
7. If necessary, use the VPrep diagnostics software to remove pipette tips and place them in the waste bin.
8. Empty the waste bin.
9. Check run logs.

   For more information about run logs, see "About Log and Output Options" on page 59.

10. Turn off environmental controls.
11. If you have Administrator or Technician privileges and you have modified the protocol, including selected options, you can save the protocol.

    For more information, see "About Creating Protocols" on page 94.

12. Log off from VWorks.
13. Optionally shut down the BioCel.
    For more information, see "Shutting Down the BioCel" on page 92.

Shutting Down the BioCel

When To Use

Shut down the BioCel if you intend to:

- ❑ Move it
- ❑ Leave it unused overnight

Procedure

To shut down the BioCel:

1. Make sure that the post-run clean up procedure was followed after the last run.

   For more information, see "Performing Post-Run Clean-Up" on page 90.
2. In VWorks, select **File > Exit** to shut down the application.
3. Shut down the computer from the Windows operating system.
4. Optionally, turn off the monitor using the power button on the monitor.
5. If you use modules or devices that require a vacuum pump, optionally turn off power at the pump if the pump module has an on/off switch.
6. Open side door 2.
7. Optionally, turn off the DC power supply switches labelled Robot and System.
8. Push the UPS button that turns off power output to all parts of the system.

   If you have more than one UPS on your BioCel, make sure that you turn them all off. For more information about turning off the UPS, see the user manual for the UPS.
9. On the power panel, turn the main power switch counterclockwise to the off position.
10. Optionally, if moving the BioCel, unplug the air, Ethernet and main power cables.

    For more information, see "External Connections" on page 25.

4 Creating a Protocol

This chapter is intended for people with Technician and Administrator privileges. It describes the process of creating a protocol and explains the parameters used to define each protocol task. Before reading this chapter you should be familiar with the concepts presented in "Performing a Run" on page 39.

The chapter is not a tutorial on writing protocols—it provides the basic reference information you will need to write protocols.

About Creating Protocols

General Information About Protocols

For general information about protocols, see "About Tasks, Processes and Protocols" on page 48.

Who Creates Protocols?

People who have Technician and Administrator user accounts have the necessary privileges to create protocols. For more information, see "User Accounts and Privileges" on page 47.

Overall Process

The overall method of creating a protocol consists of:

1. Creating a Process, which includes:
   a. Setting up a plate instance
   b. Adding tasks
   c. Setting task parameters
   d. Optionally, if you added a pipette process task, linking a pipette process task to a pipette process, adding pipette tasks and setting pipette process task parameters.
2. Optionally creating additional processes that will run at the same time.
3. Saving the protocol.

As you create a protocol, you can also compile your tasks to check for errors. For more information about compiler errors, see "Compilation Warnings and Errors" on page 193.

Saving Protocols

Background

To save a protocol you must be logged on using an Administrator or Technician user account.

When you save a protocol, all of the task parameters, and a lot of other types of information, is saved with it. For more information about what is saved with a protocol, see "Understanding the Structure of Configuration Settings in a Pipette Task" on page 130.

When you edit a protocol, the changes take effect immediately. However, unless you explicitly save the protocol, the changes are lost when you exit VWorks™.

Procedure

To save a protocol:

1. Select **File** > **Save As**.
2. In the **Save As** dialog box, navigate to the folder in which you want to save the protocol.
3. In the **File Name** text box, replace the Untitled filename with a name of your choice.
4. Click **Save**.

Setting Up a Plate Instance

Background

Setting up a plate instance for a process if the first step in creating a protocol. For a definition of a plate instance, see "About Tasks, Processes and Protocols" on page 48.

Procedure

To set up a plate instance:

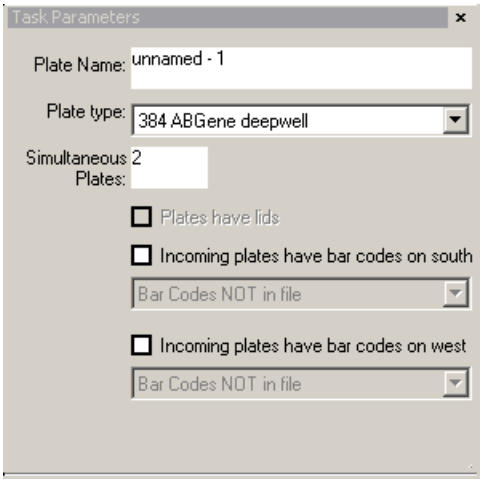
1. Click the **Protocol Editor** tab.

   This page is referred to as the protocol editor.

2. Click **Add**.

   A plate instance icon appears in the protocol editor window.

3. If the **Task Parameters** toolbar is not showing, select **View** > **Toolbars** > **Protocol Parameters**.



4. In the **Task Parameters** toolbar:

   a. Type a name for the plate in the **Plate Name** text box.

   b. Select a plate type that you want to use from the **Plate type** list box.

   c. In the **Simultaneous Plates** text box, type the maximum number of plates of this type that you want to be available to the system at one time.

      For advice on setting the number of simultaneous plates, see "Setting the Number of Simultaneous Plates" on page 98.

   d. If you plan to use lids on the plates, select the **Plates have lids** check box.

      This option is only available if the plate you selected is capable of using a lid, as defined in the labware editor.

   e. If the sample plates in the protocol have seals when they are placed on the BioCel®, check the **Plates enter the system sealed** check box.

This option does not require a PlatePierce™ on your BioCel. By not requiring a PlatePierce, it allows you to perform operations, such as restacking sealed plates, that do not require piercing.

f. If the incoming plates have a bar code on the south side, select the first **Incoming plates have a barcode**... check box.

   These are read by the robot's bar code reader.

g. In the **Bar Code Control** group box, select one of more of the options if you want bar codes on the plates to be read and compared with a bar code data file during a run.

   All BioCels can read south side bar codes. To read bar codes on other sides, a VCode® or custom reader is required.

   If you want bar codes on the incoming plates to be compared with a bar code data file when they enter the system, select the file from the list box.

h. If the incoming plates have bar codes on their west sides, select the second **Incoming plates have a barcode**... check box.

   Alternatively, make a selection from the associated list box.

For more information about bar code data files, see "Setting Bar Code Task Parameters" on page 108.

Setting the Number of Simultaneous Plates

Background

The number of simultaneous plates is the number of plates belonging to a single process that are in the system ready for processing at one time.

Plates that are in the system could be in the robot gripper, on platepads, VPrep® module shelves, plate hotels, and so on. Simultaneous plates do not include counterweight plates.

Selecting the Number

The number of simultaneous plates is set for each process in a protocol, as described in "About Creating Protocols" on page 94.

In general, the number depends on how many:

- ❑ Positions there are in the system to store plates

  If your BioCel has five plate hotels and each stores ten plates, you can run more simultaneous plates than if your BioCel has only six platepads.

- ❑ Plate instances there are in the protoocol

  Consider two protocols where the first consists of two processes and the second consists of ten processes. You can probably specify more simultaneous plates for the first process in the first protocol than you could for the first process in the second protocol. This is because the second protocol has more processes that deal plates into the system, and each process has its own specified number of simultaneous plates.

In practice the number of simultaneous plates to set for each process depends on the details of the protocol and it requires a good knowledge of protocol writing to select the optimal numbers.

If the numbers are too high, a plate is introduced into the system but there is nowhere for it to go. This results in a deadlock, at which point the robot, VPrep and protocol are stopped.

If the numbers are lower than optimal, the time for the protocol run could be extended. Typically, however, the critical factor in determining the length of a run is a particular process, such as a bar code labelling operation, and is not the numbers of simultaneous plates chosen.

A typical BioCel protocol has one or two simultaneous plates for each process.

Adding and Deleting Tasks

Background

After you have set up a plate instance for a process, you can start adding tasks.

Adding a Task

You must always add a task to a process before you can definine its task parameters.

To add a task:

1. If the **Process Tasks** toolbar is not showing, select **View** > **Toolbars** > **Protocol Tasks**.
2. In the **Process Tasks** toolbar, click the **All** tab.
3. Select a task icon and drag it to the protocol editor window until a vertical, dashed line appears.

   If you attempt to add a task that uses a module that is not installed on your BioCel, you will receive an error message.

Deleting a Task

There are other ways to delete a task, but this is the recommended way.

To delete a task:

1. In the protocol editor window, select a task.
2. Press the DELETE key on the keyboard.

About Setting Task Parameters

Background

After you have added a task, you can set parameters for it—most tasks require you to set parameters. The parameters specify the details of the task. As you set the parameters, the text underneath the task icons change to reflect the new parameters.

Types of Task

For information about specific types of tasks, see the following topics:

Topic	See page...
Setting User Message Task Parameters	101
Setting Stacker Task Parameters	103
Setting Bar Code Task Parameters	108
Setting QFill Task Parameters	113
Setting Waitfor Task and Signal Task Parameters	114
Setting Seal Task Parameters	115
Setting Incubate Task Parameters	116
Setting Restack Task Parameters	118
Setting Pierce Task Parameters	122
Setting Centrifuge Task Parameters	123
Setting Vacuum Task Parameters	125
Setting Place Plate Task Parameters	126
Setting Bio-Tek Washer Task Parameters	128

For general information about the individual modules that perform the tasks, see "BioCel Modules" on page 35.

Setting User Message Task Parameters

User Message Task Defined

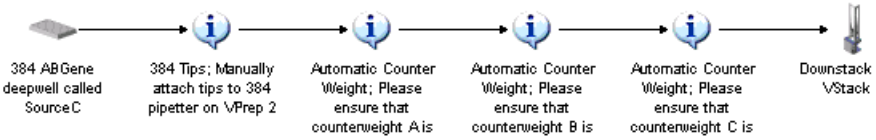
The Administrator or Technician who creates a protocol can add User Message tasks to provide reminders to the operator. The reminders are in the form of messages that appear on the screen at the appropriate time and pause the protocol until acknowledged by the operator.

User message tasks could, for example, be used to remind the operator to empty the waste container, fill a reservoir, or remove plates.

Example of Use

User messages are often given their own process. In the example shown in the screenshot below, the protocol has four user messages that remind the operator to perform final run-preparation tasks. The User Message tasks are performed before any plates are downstacked.

The intended sequencing of the User Message tasks is ensured by the addition of Signal tasks to the other processes in the protocol.


384 ABGene deepwell called SourceC
384 Tips; Manually attach tips to 384 pipetter on VPrep 2
Automatic Counter Weight; Please ensure that counterweight A is
Automatic Counter Weight; Please ensure that counterweight B is
Automatic Counter Weight; Please ensure that counterweight C is
Downstack VStack

When To Use

Use the procedure in this section when creating a protocol. To see how this procedure fits in to the overall process of performing a run, see "Workflow Overview" on page 40.

Procedure

For general information about creating a protocol and the steps required before performing this procedure, see "About Creating Protocols" on page 94.

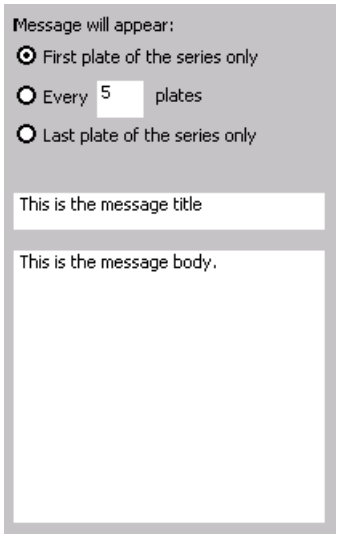
To set User Message task parameters:

1. In the process window, click the User Message icon.
2. In the **Task Parameters** toolbar, select one of the following **Message will appear** options:

Option	Description
First plate of the series only	Displays the message the first time it is encountered for that process during the run.

Option	Description
Every *x* plates	Displays the message the first time it is encountered for that process during the run, and then every *x* number of times it is encountered for that process during the run. For example, if the value of *x* is 3, the first plate in the process will trigger the message, the next two plates will not trigger the message, and the fourth plate will trigger the message.
Last plate of the series only	Displays the message the last time it is encountered for that process during the run.

3. Type the message that you want to display:
   a. Type the message title in the top text box.
   b. Type the message body in the bottom text box.


Message will appear:
First plate of the series only
Every 5 plates
Last plate of the series only
This is the message title
This is the message body.

Setting Stacker Task Parameters

Stacker Task Defined

The Stacker task moves plates in to or out of VStack® module racks.

The process of moving a plate out of a rack is called downstacking. The process of moving a plate to a rack is called upstacking.

Plates may be returned to the same or a different VStack module.

A single task can upstack to, or downstack from, more than one rack. For example, in a downstacking task, when all of the plates are removed from one rack the robot will pick plates from a second rack. The two racks are referred to as pooled downstackers.

When To Use

Use the procedure in this section when creating a protocol. To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

For the steps required before performing this procedure, see "About Creating Protocols" on page 94.

Procedure

To set Stacker task parameters:

1. In the process window, click to select the Stacker task icon.
2. In the list of available VStack modules of the **Task Parameters** toolbar, select a VStack that you want to downstack from, or upstack to, and click **Add**.

   To select more than one VStack, you can SHIFT-click or CTRL-click before clicking **Add**.
3. If you want to remove a VStack from your list of available VStack modules, select it and click **Remove**.
4. If you have added more than one VStack rack, you can change the order in which a particular rack is used:
   a. Select a VStack module.
   b. Click **Use earlier** to promote the VStack module or **Use later** to demote it.
5. To specify a time interval for when plates are made available to the system, select the **Release a new plate** check box and type in an interval time.

   You could use this feature to avoid a plate processing bottleneck that results in plates having different incubation times. Consider a simplified example process in which plates are downstacked, incubated for 5 minutes, dispensed into, and then upstacked. When the protocol begins, the first plates are sequentially moved to platepads for incubation. The process of moving them only takes a few seconds so they are incubated simultaneously with slightly staggered incubation start times. Because the dispense task takes

longer than the time taken to move the plates to platepads, it is the limiting step and creates a processing bottleneck.

If the dispense task takes 2 minutes, plates that are ready for the pipetting step would have to wait. In this example, the first plate would incubate for approximately 5 minutes, the second plate for approximately 7 minutes, the third plate for approximately 9 minutes, and so on. To avoid these different incubation times, you could downstack one plate every 2 minutes. The plates are then incubated sequentially and not simultaneously

6. If you want to dynamically assign upstacking VStacks, click **Add dynamically-assigned stacker**.

   This option is only available for upstacking tasks.

   With dynamic assignment you do not have to specifically assign every VStack that will receive plates because assignments are made automatically. All plates from the same downstacking VStack are moved to the same upstacking VStack.

   When VStacks are dynamically assigned, the text "TBD," meaning To Be Determined, is added to the Stacker task icon.

   You can determine which VStacks contain which plates at the end of the run by consulting the run log or the VStack displays.

About Bar Code Reading and Tracking

Introduction

This section gives an overview of the bar code reading and tracking abilities of the BioCel.

For information about planning to add bar code labels to plates, see "About Bar Code Format and Data Files" on page 106.

For information about adding Bar Code tasks to a protocol, see "Setting Bar Code Task Parameters" on page 108.

Bar Code Readers and Printers

Every BioCel has a bar code reader built into its robotic arm that reads bar codes on the south side of a plate. Every time a plate with a south-side bar code is picked up, the bar code reader reads the bar code.

Customized BioCels can have additional readers that read bar codes on other sides of the plate. These may be installed on VPrep shelves and platepads. Every time a plate is moved to one of these devices the bar code is read.

Note: To read a bar code at a platepad bar code reader, use the Place Plate task. For more information see "Setting Place Plate Task Parameters" on page 126.

If your BioCel has a VCode, your BioCel has the additional ability to print and apply bar code labels. If the VCode includes an optional reader, your BioCel can read bar code labels on any side of the plate by turning the plate to expose different sides to the reader.

Bar Code Tracking

VWorks tracks the bar codes of all plates in the system that have bar codes applied either:

- ❑ On the BioCel
- ❑ Before entering the BioCel, but which were read as they entered the system

The VWorks database associates each bar code with a plate location so it "knows" where each plate is at all times. Every time a plate is picked up, the robot's bar code reader reads the south-side bar code and checks it against the associated plate location. If the bar code does not match the bar code associated with that location, a mismatch error is reported.

For more information about bar code mismatch errors, see "Resolving Platform Bar Code Reader Errors" on page 200.

About Bar Code Format and Data Files

Bar Code Format Files

Bar Code formats specify the type, number, properties and location of fields that are printed on bar code labels using a Bar Code task. They are stored in a text file.

Some formats are provided with the VCode, but you can define others according to your needs.

For more information about formats, see the *VCode User Manual*.

Bar Code Data Files

When To Use

You may decide to use bar code data files to:

- ❑ Specify each instance of a bar code that is printed on a plate while on the BioCel
- ❑ Verify the bar codes on incoming plates, which are plates that are downstacked into the system

If you do not want to use bar code data files, you can specify how you want to increment your bar codes when setting bar code parameters.

For information about setting up protocols to verify incoming plate bar codes, see "About Creating Protocols" on page 94.

How They Are Created

Data files are typically generated by a LIMS system. They contain lists of bar codes or bar code roots that are grouped together in series. For more information about the structure of a bar code data file, see the *VCode User Manual*.

Bar Code Data File Format

Bar code data files are text files with a .bar filename extension.

About Linking a Bar Code Data File

Before using a bar code data file, you must create the file and manually place it in a folder on the BioCel computer's hard drive. The location of this file must then be selected from within VWorks. For more information about setting the location of the bar code data file, see "Setting General Options (Optional)" on page 54.

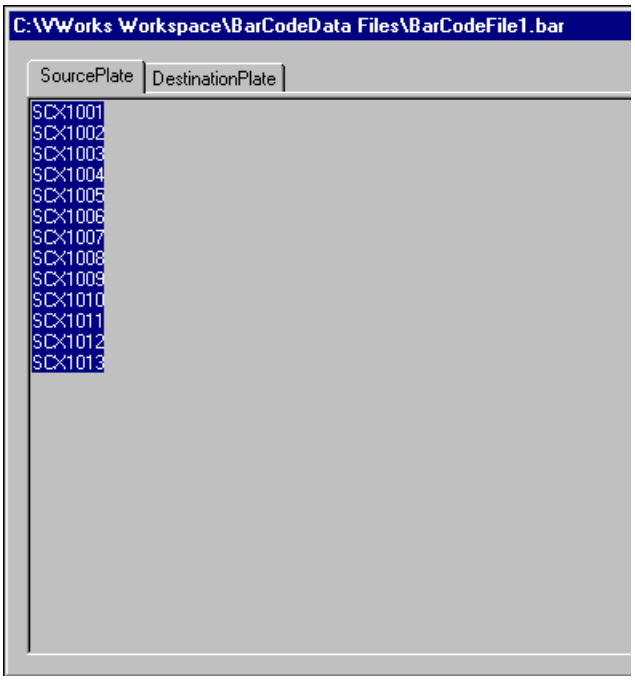
Viewing a Bar Code File

You can view the contents of the bar code file that is currently associated with VWorks from within VWorks.

To view a bar code file:

1. Select **Tools > Show Bar Code File**.

   This opens a view of the bar code data file.



2. Click a tab to show a different series of data.
3. To close the window, click the close box.

Updating a Bar Code Data File

If you change a bar code data file while a protocol is running, you must reload the file for the change to be registered.

To reload a bar code data file:

1. Select **Tools > Reload Bar Code File**.

Setting Bar Code Task Parameters

Bar Code Task Defined

The Barcode task uses a VCode to print a bar code label and apply it to a plate.

Bar Code Labelling Decisions

Before you add a Barcode task to a protocol, consider your record-keeping and automation needs. For example:

- ❑ Do you need each bar code label to be unique within a run, but not from run to run?
- ❑ Do you need each bar code label to be unique across all runs?
- ❑ Will you be using a Laboratory Information Management System (LIMS) for barcoding information and record-keeping?
- ❑ What human-readable fields do you want to include on the label?

When To Use

Use the procedure in this section when creating a protocol.

For an overview of the process of performing a run, see "Workflow Overview" on page 40.

For the steps required before performing this procedure, see "About Creating Protocols" on page 94.

For a discussion of bar code symbologies, see the *VCode User Manual*.

Procedure

To set Bar Code task parameters:

1. In the process window, click the **Barcode** task icon.
2. In the **Task Parameters** toolbar, click a tab corresponding to the sides of a plate.

   The options are **South**, **West**, **North** and **East**.
3. Select one of the options in the printing options list box.

If...	Then...
You do not want to place a label on this side of the plate	Select **No Label** from the **Printing Option** list box, and return to step 2.
You want to print a label that is the same as a label already set up for another side of the plate	Select **Use <Side> label**, and continue with step 2. All other parameters on the page are ignored.
You want to define a bar code label and place it on this side of the plate	Select **Use this label** from the **Printing Option** list box, and continue with step 4.

4. In the **Format to use** text box, type a number that corresponds to the bar code format that you want.

5. In the **Number of Fields** text box, type the number of fields that you want to print on the bar code.

   The maximum number of fields you can print is limited by the number of fields in the format you selected. For example, if the format specifies three fields you cannot print a bar code with four fields. In this example, if you do enter the number four into the text box, the last field is ignored.

   VWorks does not delimit the number that you can type in this field and does not provide an error message, so you must remember to enter a valid number.

6. In the **Field 1** text box, enter one or more of the following types of information that you want to be printed in the first field position on the label:

If You Want to Print...	**Then...**
A human-readable text field that does not increment	Type the text in the text box.
A bar code field that is identical to a bar code field on another side of the plate	a. Select the side of the plate from the **from <*side*> side** list box. b. Click **Use existing barcode**. This places the code [BC] in the text box. *Note:* This option copies a bar code field from another side of the plate. The similar option selected in the **Printing Options** list box copies an entire bar code from another side of the plate.
A series of bar codes from a bar code data file	a. Make sure that the number of bar codes specified in the series that you want to use is greater than the number of labels that you want to print. b. Select the series in the **Bar Code File Entry** list box. c. Place the cursor in the **Field** text box. d. Click **From File**.

If You Want to Print...	Then...
A series of bar codes that increment, but which are not specified by a bar code data file	a. Type the root text that you want in the Field text box. b. Click **Increment**. This adds the code [INC] to the root text. c. In the **Increment Chars** text box, type the number of alphanumeric characters that you want to be appended to the root text. For example if you want the series to increment from 01 type `2`. If you want it to increment from 001, type `3`. d. In the **Starting Increment #** text box, type the number that you want to be printed on the first label. e. Select either **Base 36** or **Base 10** depending on the increment style you prefer. Base 36 uses alphanumeric increments (0–9, A–Z). Base 10 uses numeric increments only (0–9).

The field numbering in the **Task Parameters** toolbar is different from the field numbering in a format. The first field in a format is 0, but this corresponds to **Field 1** in the **Task Parameters** toolbar. For more information, see "Bar Code and HR Field Data Duplication" on page 110 below.

7. Return to step 6 and fill out another field until all required fields are completed.

   If you enter information in a field that does not exist in the format you have chosen, the information is ignored.

8. Return to step 2 and define labels to put on other sides of plate.

Bar Code and HR Field Data Duplication

It is common practice to follow a bar code field with a human readable field that has the same information.

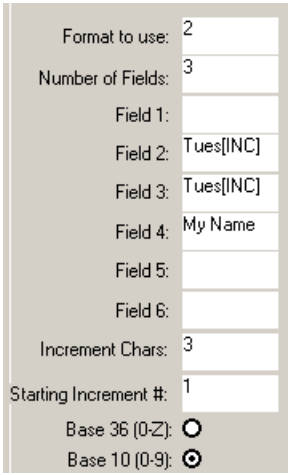
The following table shows an example of how you can set this up.

Format Field	VWorks Field	Field Type	VWorks Field Contents
Field 0	Field 1	Code 39	Run1
Field 1	Field 2	Human readable	Run1

Field 0 of the selected format (Format Field column) is a bar code field. Field 1 of the selected format is a human readable text field. The same text is typed into Field 1 and Field 2 of the VWorks Task Parameters toolbar, and this produces a bar code label with a bar code in position 1 and the same information as text in position 2.

Combining Bar Code Modifiers

You can combine bar code modifiers with text in a single field. In the following example, Format 2, which has five available fields, is selected as the format to use. Three of the fields are used: Field 2, Field 3, and Field 4.



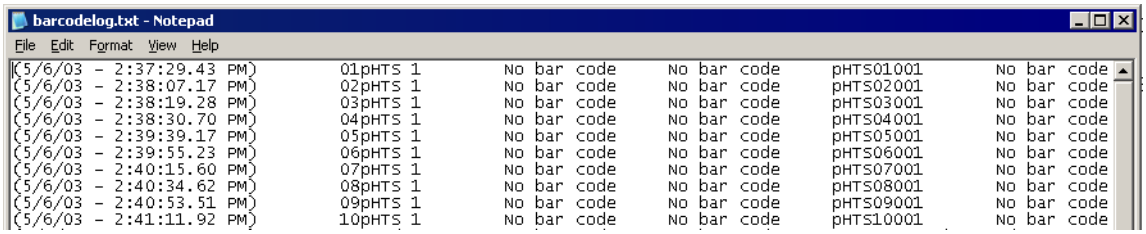
Field 2 prints a bar code that is incremented for each printing. Field 3 prints the same bar code in human readable format. The text entered into Field 3 is the same as that entered into Field 2, but the format selected for the bar code is Format 2, and this format specifies that Field 3 is a human-readable field.

The information entered in Field 3, combined with the information entered into the Increment Chars and Starting Increment # fields, creates the following bar code sequence:

Tues001
Tues002
Tues003
Tues004
Tues005
Tues006
Tues007...

The Bar Code Log File

Information about the bar codes that are applied is saved in a bar code log file. Because this is a tab-delimited text file, the data can easily be imported into a spreadsheet program.


barcodelog.txt - Notepad
File Edit Format View Help
(5/6/03 - 2:37:29.43 PM) 01pHTS 1 No bar code No bar code pHTS01001 No bar code
(5/6/03 - 2:38:07.17 PM) 02pHTS 1 No bar code No bar code pHTS02001 No bar code
(5/6/03 - 2:38:19.28 PM) 03pHTS 1 No bar code No bar code pHTS03001 No bar code
(5/6/03 - 2:38:30.70 PM) 04pHTS 1 No bar code No bar code pHTS04001 No bar code
(5/6/03 - 2:39:39.17 PM) 05pHTS 1 No bar code No bar code pHTS05001 No bar code
(5/6/03 - 2:39:55.23 PM) 06pHTS 1 No bar code No bar code pHTS06001 No bar code
(5/6/03 - 2:40:15.60 PM) 07pHTS 1 No bar code No bar code pHTS07001 No bar code
(5/6/03 - 2:40:34.62 PM) 08pHTS 1 No bar code No bar code pHTS08001 No bar code
(5/6/03 - 2:40:53.51 PM) 09pHTS 1 No bar code No bar code pHTS09001 No bar code
(5/6/03 - 2:41:11.92 PM) 10pHTS 1 No bar code No bar code pHTS10001 No bar code

You can specify the folder in which you want to save the log file. For more information about setting up log files, see "About Log and Output Options" on page 59.

Setting QFill Task Parameters

QFill Task Defined

The QFill task dispenses liquids into plate wells and offers the option of vacuum filtration. If you want to use vacuum filtration, your QFill must include the vacuum station option developed by Velocity11®.

If your QFill2 does not contain the vacuum station option, you can use a separate vacuum station. For more information about setting up vacuum filtration as a separate task, see "Setting Vacuum Task Parameters" on page 125.

When To Use

Use the procedure in this section when creating a protocol.

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

For the steps required before performing this procedure, see "About Creating Protocols" on page 94.

Procedure

To set QFill task parameters:

1. If you are creating a protocol with a QFill2 reagent that you have not used before:
   a. Make sure that the QFill task has not yet been added to the process.
   b. Select **Tools** > **Manage Reagents**.
   c. In the **Manage Reagents** dialog box, select a QFill module from the Device list box.
   d. Enter a name for the reagent that you want to use on the QFill2.
   e. Click **OK**.
2. Drag a QFill task icon to the process window to add the task.
3. In the **Task Parameters** toolbar enter the volume of liquid that you want to add to the plate wells.
4. In the **Reagent** list box, select the liquid that you want to use.
5. If you want to use vacuum filtration, in the **Filtration** group box:
   a. Select the **Use filtration** check box.
   b. Complete the **Begin filtration** sentence, specifying how long before or after filling you want the filtration to start.
   c. Type a filtration duration in the **Filter for** text box.
   d. If you want to add a post-filtration delay, type the delay time in the remaining text box.

      The delay is the time that elapses before the robot will pick up the plate, allowing the vacuum under the plate to dissipate. If this value is too small the robot may not pick up the plate correctly.

Setting Waitfor Task and Signal Task Parameters

Introduction

The Waitfor task works with a Signal task to specify the order across processes in which tasks are performed. You must first set the Waitfor task and then set the Signal task.

For more information about how to use Waitfor tasks and Signal tasks, see "Specifying Task Order Across Processes" on page 129.

When To Use

Use these procedures when creating a protocol.

To see how these procedures fit into the overall process of performing a run, see "Workflow Overview" on page 40.

For the steps required before performing this procedure, see "About Creating Protocols" on page 94.

Setting Waitfor Task Parameters

To set Waitfor task parameters:

1. In the process window, click the Waitfor task icon.
2. In the **Task Parameters** toolbar, type a name for the task.

Setting Signal Task Parameters

To set Signal task parameters:

1. In the process window, click the Signal task icon.
2. In the **Available waitfors** text box of the **Task Parameters** toolbar, select the Waitfor task that you want to reference.
3. Click **Add**.

Setting Seal Task Parameters

Seal Task Defined

The Seal task places a seal on a plate using a PlateLoc®.

If you are using more than one type of plate or seal and require different sealing temperatures, we recommend that you use a separate PlateLoc for each temperature. This will avoid time delays as the PlateLoc heats and cools between different plate or seal types.

When you open a protocol containing one or more Seal tasks, PlateLocs will immediately start adjusting to the temperatures defined in the task parameters.

When To Use

Use the procedure in this section when creating a protocol.

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

For the steps required before performing this procedure, see "About Creating Protocols" on page 94.

Procedure

To set Seal task parameters:

1. In the process window, click to select the Seal task icon.
2. In the **Task Parameters** toolbar, enter a seal time and seal temperature.

   When you enter a seal temperature, the PlateLoc will immediately start adjusting to that temperature.
3. Select the PlateLoc to use for the sealing operation from the **Select PlateLoc to use** list box.

   If you have more than one PlateLoc on the BioCel, make sure that you select the module with the correct sealing temperature and sealing time for the plate.

Setting Incubate Task Parameters

Incubate Task Defined

The Incubate task performs a timed incubation of a plate. It is typically used for short incubations.

The number of plates that can be incubated simultaneously is limited by the number of platepads and plate hotels that are available for holding plates.

When To Use

Use the procedure in this section when creating a protocol.

If you want to perform a longer incubation of more than one plate and want to reduce evaporation from the plates, see "Setting Restack Task Parameters" on page 118.

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

For the steps required before performing this procedure, see "About Creating Protocols" on page 94.

Process Overview

The overall process for a typical incubation is:

1. Incubation of the plate starts with the addition of an initiating reagent.

   This would be performed by a liquid handling task, such as a QFill Task or Pipette Process Task.

2. The plate is moved to a platepad.

   When the plate arrives at the platepad, the incubation time parameter that you specify starts timing.

3. The plate is moved from the platepad to a reader.

   The plate is moved when the incubation time parameter that you specify ends.

Incubation Time Error

The time parameter that you set for the incubation period is not the actual time of the incubation. It represents the minimum time that the plate will sit on the platepad where the Incubation task is carried out.

The actual incubation period starts when the initiating reagent is added and continues until the plate is transferred to the next step in the process. This means that the actual incubation is longer than the time parameter that you set, by an amount that depends on the scheduling and operating speed of the robot.

If your assays require greater precision in plate incubation times than this method supports you can use internal controls on each plate to allow you to adjust data across plates if you need to.

Procedure

To set Incubate task parameters:

1. In the process window, select the Incubate task icon.
2. In the **Task Parameters** toolbar, type the length of time for which you want the plate to incubate on the platepad.
3. If you want to perform a time-series incubation, in which each plate is incubated for a time longer than the previous plate, select the **Time relative to last plate** check box.

Setting Restack Task Parameters

Restack Task Defined

The Restack task collects plates in a VStack, moves them to another VStack in a definable time, and in a way that reverses the order of the plates, and passes the plates to another task.

The Restack task is used as part of a larger process that carries out simultaneous, timed incubations of more than one plate, where the goals are for the:

- ❑ Time between the start of the incubation and the reading of the plate to be approximately the same for each plate
- ❑ Evaporation from the plates to be minimized

The minimum incubation time for this task is 30 seconds.

If you want to perform a simple, timed incubation that takes place on platepads or plate hotels, and which is useful for short incubations, see "Setting Incubate Task Parameters" on page 116.

When To Use

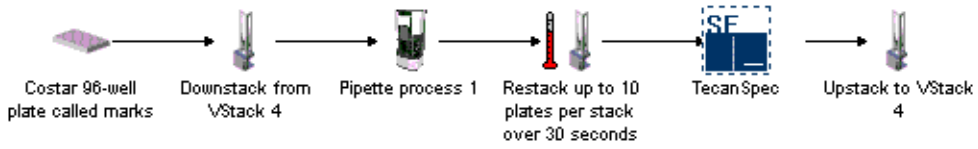
Use the procedure in this section when creating a protocol.

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

For the steps required before performing this procedure, see "About Creating Protocols" on page 94.

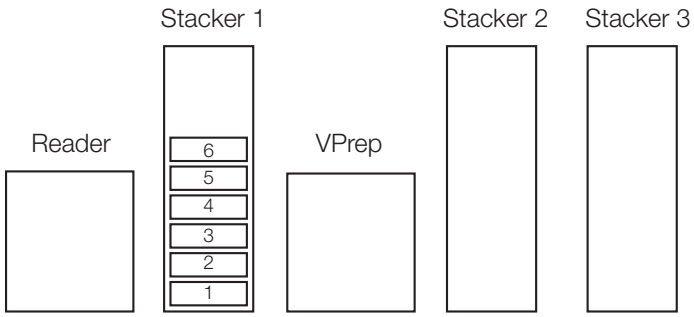
Process Overview

To understand the concept of a Restack task, it is best to view it in the context of a protocol. Consider the following simple restacking protocol as an example.

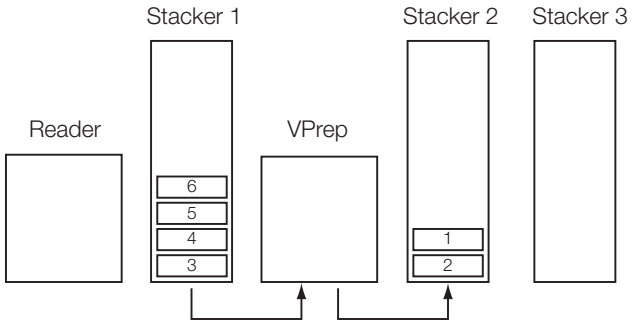

Costar 96-well plate called marks
Downstack from VStack 4
Pipette process 1
Restack up to 10 plates per stack over 30 seconds
Tecan Spec
Upstack to VStack 4

The overall flow of events in the protocol, in which individual steps do not necessarily correspond to individual protocol tasks is as follows:

1. The plates are in a VStack (Stacker 1) ready for the run.

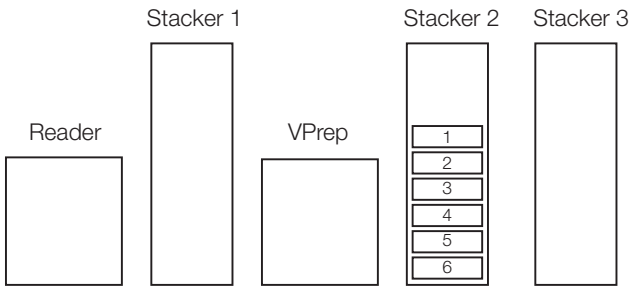


2. The plates are downstacked and moved to a VPrep where a reagent is added to initiate the incubation. The restack task begins when the plates are then moved to an empty rack (Stacker 2).



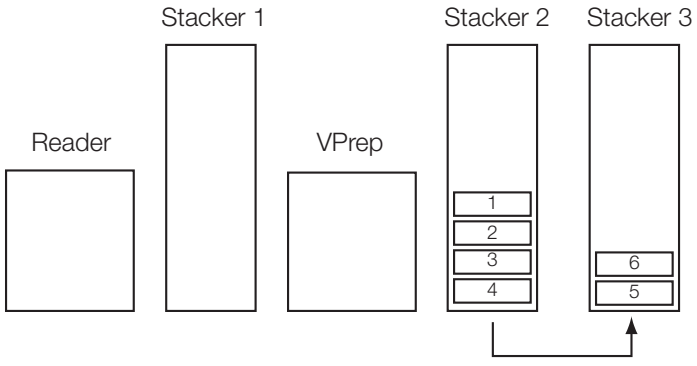
When the first plate enters the empty stacker the incubation time parameter that you specify starts timing. However, the actual incubation started when the initiating reagent was added. The time between the actual incubation start and the time at which the incubation time parameter starts depends on the scheduling and operation speed of the robot, so it may not be consistent from one plate to another.

3. The remaining plates are moved to the receiving stacker. The last plate to start incubating is now on the bottom.

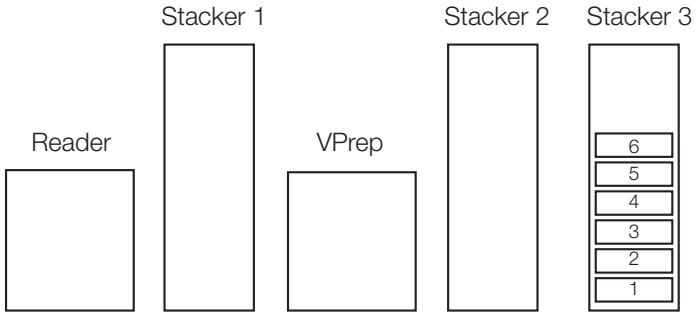


If plates are moved directly to a reader from this position the plate that has incubated for the least time is read first, leading to a large inconsistency in inter-plate incubation times. The plates must be restacked so that the plate that started incubating first is read first.

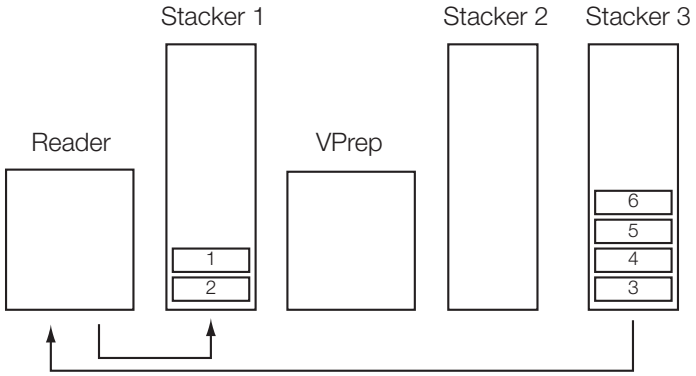
4. The plates are moved to another stacker, reversing their order.



5. The remaining plates are restacked so that the plate that started incubating first lies on the bottom.

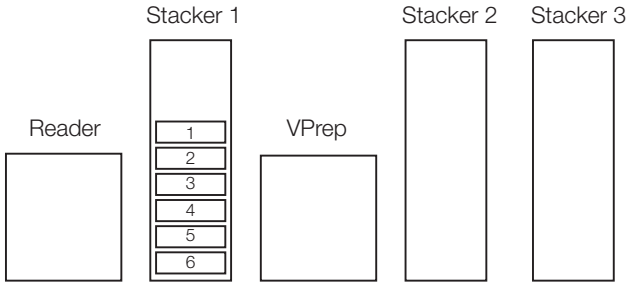


6. The plates are moved, one at a time, to a plate reader, and then to different rack for storage. In this example, the final rack is the same as the starting rack. The plates are moved from the rack to the reader after the time interval specified in the Task Parameters toolbar.



The actual incubation continues as the robot moves the plate to the reader and the reader prepares to take measurements.

7. When the run is complete all plates are in the final rack ready for removal from the BioCel.



Procedure

To set Restack task parameters:

1. In the process window, click the Restack icon.
2. In the **Task Parameters** toolbar either:
   - Select the empty stackers that you want to use for the task, and click **Add.**
   - Click **Add dynamically-assigned stacker**.

     With this option, the scheduler automatically assigns stackers during a run, and there must be at least two VStacks available for this operation. VWorks pools racks that contain plates that use the same plate instance. For example, if a protocol specifies source plates entering the system for VStack 1 and VStack 2, VWorks will automatically begin downstacking from VStack 2 once VStack 1 is empty. You can consult the **VWorks log** toolbar to see the assignments made during the run.
3. In the **Store up to** text box, type a number greater than the number of plates you intend to incubate.

   This value is important because it can affect the timing of the incubation. For example, if the time taken to move all plates to the first restack stacker is greater than the time specified for the incubation, the first plate cannot be restacked and moved to the next task in time. This problem can be resolved by moving plates to two stackers before they are restacked.
4. In the **Incubate plate for** text box, type the time interval, between when a plate enters the first restack stacker and leaves the second restack stacker.

!! IMPORTANT !! When you start a run that includes a Restack task, you must type in a number that is equal to the number of plates you want to restack in the Number of Runs dialog box. For more information, see "Starting a Run" on page 78**.**

Setting Pierce Task Parameters

Pierce Task Defined

The Pierce task pierces a sealed plate using a PlatePierce.

When To Use

Use the procedure in this section when creating a protocol.

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

For the steps required before performing this procedure, see "About Creating Protocols" on page 94.

Procedure

To set Pierce task parameters:

1. In the process window, click the Pierce task icon.
2. In the **Task Parameters** toolbar, enter a value in the **Piercing Pressure** text box.

Setting Centrifuge Task Parameters

Centrifuge Task Defined

The Centrifuge task centrifuges a plate using a VSpin™.

This section describes how to set the parameters for the Centrifuge task. Before you can run a protocol that uses a Centrifuge task, you must also set up one or more counterweight plates, so read this section in conjunction with "Setting Up a VSpin Counterweight Plate" on page 74.

When To Use

Use these procedures when creating a protocol.

To see how this section fits into the overall process of performing a run, see "Workflow Overview" on page 40.

For the general steps required before setting Centrifuge task parameters, see "About Creating Protocols" on page 94.

Managing Counterweights

If you intend to use the robot to load counterweights you must associate the platepad that will house the counterweight during the task with the type of labware that the counterweight is. This is so the robot can accurately pick the plate up.

You must make this association before you set the Centrifuge task parameters.

To associate a platepad with a counterweight plate type:

1. Identify a type of sample plate to centrifuge in the protocol.
2. Select **Tools** > **Manage Counterweights**.
3. In the **Manage Counterweights** dialog box, select the platepad on which you want the operator to place the counterweight.
4. In the **Labware type** list box, select the same labware type as the sample plate (first icon in the process).
5. Repeat this procedure for any different types of sample plate to be centrifuged.
6. Click **OK**.

Setting Centrifuge Task Parameters

To set Centrifuge task parameters:

1. In the process window, click the Centrifuge task icon.
2. In the **Spin time** text box of the **Task Parameters** toolbar, select two digits that correspond to the hours, minutes, or seconds that you want to change, and replace the numbers.
3. Repeat step 2 as needed.
4. Use the sliders to select the percentages of maximum velocity, maximum acceleration and maximum breaking deceleration.
5. If there is more than one VSpin module on the table, select the one you want to use for this task from the **Select VSpin to use** list box.
6. Select the counterweight plate that you want to use for this task:
   - If you intend to manually place a counterweight plate into the centrifuge before starting the run, select **manually inserted counterweight**.
   - If you want the robot to deliver a counterweight plate to the centrifuge, select the platepad that will contain the correct counterweight plate, according to the associations you made in "Managing Counterweights" on page 123.

For information about setting up a counterweight plate, see "Setting Up a VSpin Counterweight Plate" on page 74.

Setting Vacuum Task Parameters

Vacuum Task Defined

The Vacuum task requires a vacuum plate and vacuum pump to be fitted on the BioCel. The task is used with filter plates.

When To Use

Use the procedure in this section when creating a protocol.

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

For the steps required before performing this procedure, see "About Creating Protocols" on page 94.

Procedure

To set Vacuum task parameters:

1. In the process window, click the Vacuum task icon.
2. In the **Task Parameters** toolbar:
   a. In the **Amount of time to draw vacuum** text box, enter the length of time that you want the vacuum to pull.
   b. In the **post-vacuum delay** text box, enter the time that you want to elapse between the time the vacuum pump stops and when the plate is available to be picked up by the robot.

      The delay is the time that elapses before the robot will pick up the plate, allowing the vacuum under the plate to dissipate. If this value is too small the robot may not pick up the plate correctly.

Setting Place Plate Task Parameters

Place Plate Task Defined

The Place Plate task moves a plate to any location. This task has many uses.

The next task in the process after a Place Plate task will move the plate to another location.

Note: Do not confuse this task with the Plate instance, described in "Setting Up a Plate Instance" on page 96.

Using the Place Plate Task To Read Bar Codes

The Place Plate task can be used in combination with a platepad bar code reader to read a bar code. The requirements for this are:

- ❑ The platepad reader must be set up in the device manager as a device.
- ❑ The plate instance for the plate must indicate that the plate has a bar code on the side that the bar code reader reads.

Whenever a plate is placed on this platepad the scheduler tells the bar code reader to read the plate.

Using the Plate Place Task for DNA Transfers

The Place Plate task can be used in a process that uses a pin tool to repetitively transfer DNA from a master plate. The master plate would be positioned at the location specified in the Place Plate task parameters toolbar.

When To Use

Use the procedure in this section when creating a protocol.

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

For the steps required before performing this procedure, see "About Creating Protocols" on page 94.

Procedure

To set Place Plate task parameters:

1. In the process window, click the Place Plate task icon.
2. Select the position to which you want to move the plate.

   You may need to scroll down to make your selection. If you are using this task to read a bar code on a platepad, make sure you select the bar code reader device.
3. If the Place plate task is the first task in the protocol and you want to require that the operator confirms the bar code on the plate that is placed, check the **Manually confirm bar code** check box.

   This can prevent the wrong plate from being used in the protocol, which could be a costly mistake if you are using expensive reagents.

   To confirm the bar code, when the plate is picked up, the operator is prompted to enter the bar code of the plate that should be in the placed position. If the two codes do not match, an error is generated.

Setting Bio-Tek Washer Task Parameters

Bio-Tek Washer Task Defined

A Bio-Tek Washer task runs a single Bio-Tek washer program.

When To Use

Use the procedure in this section when creating a protocol.

To see how this procedure fits into the overall process of performing a run, see "Workflow Overview" on page 40.

For the steps required before performing this procedure, see "About Creating Protocols" on page 94.

Procedure

To set Bio-Tek Washer parameters:

1. In the Process window, click the Bio-Tek Washer icon.
2. In the **Task Parameters** toolbar, from the list box, select the program that you want to run.
3. If you want to see the parameters used for that program, modify a program, or create a program, click **Show Programs**.

   This opens the Bio-Tek Diagnostics software. For more information, see "Using Bio-Tek Diagnostics Software" on page 182.

Specifying Task Order Across Processes

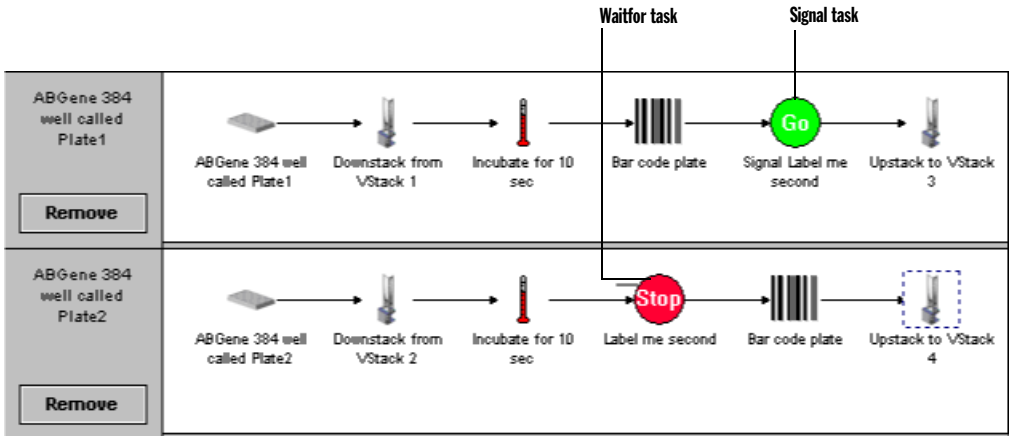
Introduction

If you are running more than one process in a protocol, you may want to specify that a particular task in one process is performed before a particular task in another process. You do this when creating a protocol by using the combination of a Waitfor task and a Signal task. The two tasks work together.

Example

In this example, the Administrator or Technician creating the protocol wants to make sure that a bar code is applied to plate 1 before plate 2.

The operator creates the protocol shown in the following diagram.



The order in which plate 1 and plate 2 are incubated is selected by the scheduler program. Without the Waitfor and Signal tasks, this would also be the case for the barcoding operation. However, in this protocol, the Waitfor task, called “Label Me Second”, is included for Plate 2, and this causes the process to wait until it receives an instruction to continue. Meanwhile, the bar code is applied to Plate 1.

After the bar code has been applied to Plate 1, the Signal task called “Signal Label Me Second” releases the wait condition on Plate 2 and the bar code is applied.

For information about how to set up the Waitfor and Signal tasks, see ”About Creating Protocols” on page 94.

Understanding the Structure of Configuration Settings in a Pipette Task

About This Section

This section will help you to understand why you perform certain operations in VWorks and how different types of configurations interact to create a functioning protocol.

About Configuration Settings

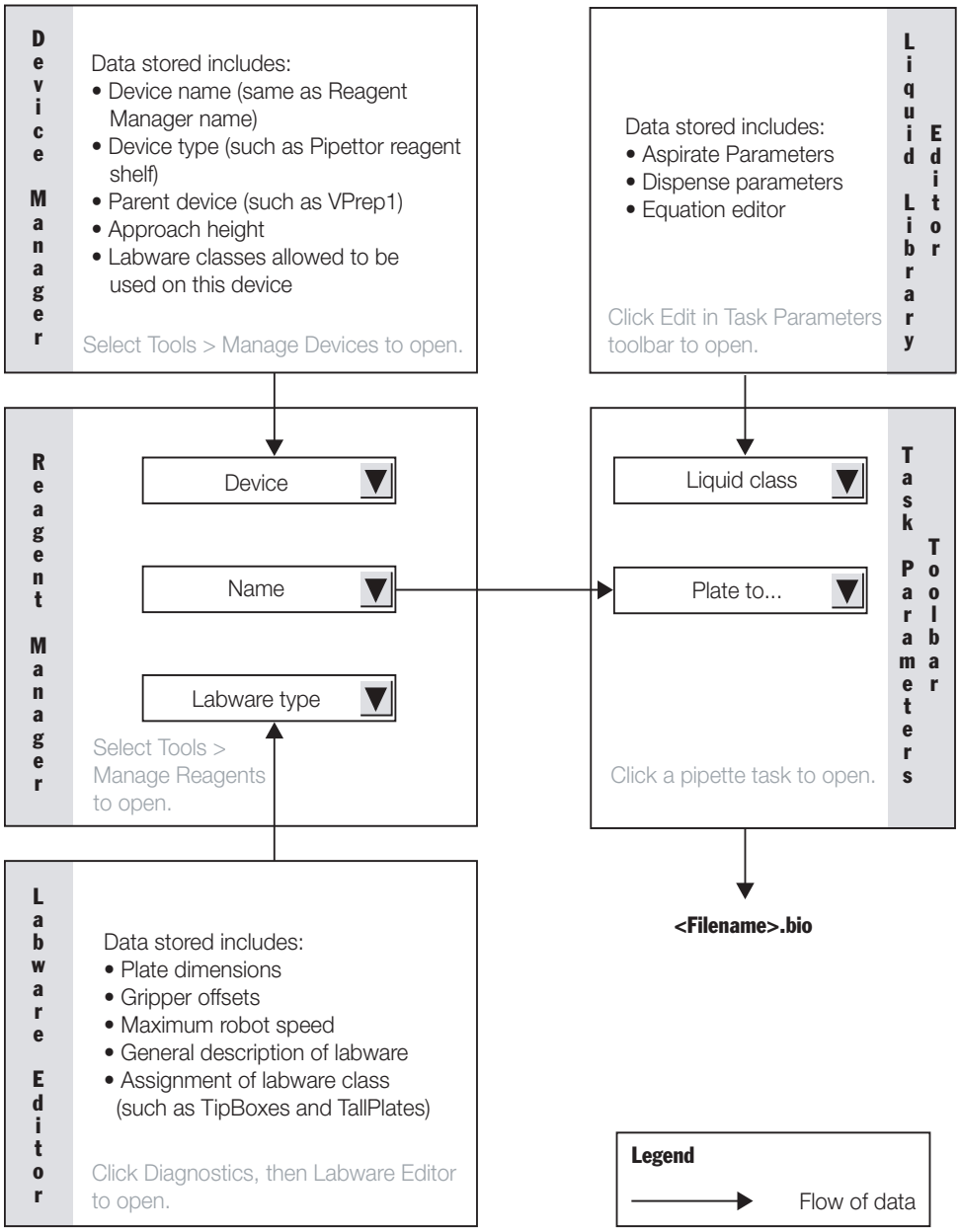
Dozens of separate pieces of data are required by VWorks to complete a single pipette task. These range from the velocity at which to aspirate a liquid to the height at which the gripper should approach a plate sitting on a platepad. These data are known as configuration settings. With the right privileges, you can modify and add configuration settings to fine-tune and extend the capabilities of your BioCel.

How you can modify configuration settings is discussed in other sections of this guide. This section provides the conceptual background you need to understand:

- ❑ The relationships between the device manager, reagent manager, Labware Editor, liquid library editor and task parameters
- ❑ What information is stored in a protocol
- ❑ Why you perform certain steps when creating protocols
- ❑ How to resolve protocol errors

Diagram

The following diagram explains how information flows from the various data stores in VWorks into a single pipette task that is stored as part of a protocol file.


Device Manager
Data stored includes:
• Device name (same as Reagent Manager name)
• Device type (such as Pipettor reagent shelf)
• Parent device (such as VPrep1)
• Approach height
• Labware classes allowed to be used on this device
Select Tools > Manage Devices to open.
Liquid Library Editor
Data stored includes:
• Aspirate Parameters
• Dispense parameters
• Equation editor
Click Edit in Task Parameters toolbar to open.
Reagent Manager
Device
Name
Labware type
Select Tools > Manage Reagents to open.
Task Parameters Toolbar
Liquid class
Plate to...
Click a pipette task to open.
<Filename>.bio
Labware Editor
Data stored includes:
• Plate dimensions
• Gripper offsets
• Maximum robot speed
• General description of labware
• Assignment of labware class (such as TipBoxes and TallPlates)
Click Diagnostics, then Labware Editor to open.
Legend
Flow of data

Three main kinds of information are associated with a pipette task. These are:

- ❑ Device information
- ❑ Labware information
- ❑ Liquid properties information

The reagent manager acts like a software adapter whose sole purpose is to create the associations between the device information and the pipette task, and the labware information and the pipette task. These associations are created by selecting particular devices and labware types from the list boxes in the reagent manager. Then, the name of that instance of the reagent manager configuration is associated with the task by selecting the “Plate to...” list box of the Task Parameters toolbar for a pipette task.

The association between the liquid type and the pipette task is made directly be selecting a liquid class for the pipette task.

When a protocol is saved, the device manager settings, labware editor settings and liquid library editor settings for each task are all saved with it.

For more information about the reagent manager, see ”Managing Reagents” on page 133.

For more information about the device manager, see ”Managing Devices” on page 135.

For more information about the liquid library editor, see ”Setting Labware and Liquid Parameters” on page 159.

Managing Reagents

Introduction

Before you can set parameters for many pipette tasks, you must first associate the labware to be used in the task with a labware type and a VPrep shelf.

To do this, you:

- ❑ Associate the labware used in the task with a labware type and device, using the Manage Reagents dialog box, which is described in this section.
- ❑ Associate the device with a VPrep shelf using the device manager.

The association created in the Manage Reagents dialog box is given a name that you will later select in the device manager, and again when you set the pipette task parameters.

Before continuing with the procedure in this section, read "Understanding the Structure of Configuration Settings in a Pipette Task" on page 130.

When To Use

Use the procedure in this section when creating a pipette process.

For the steps required before performing this process, see "About Creating Protocols" on page 94.

Procedure

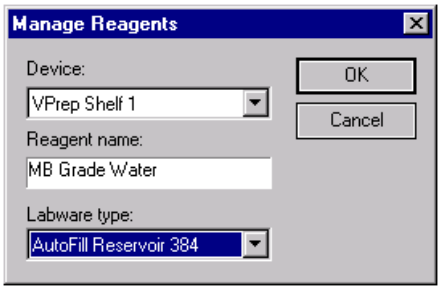
After performing this procedure, the name of the VPrep shelf device changes to the name that you choose in this procedure. For more information about this, see "Managing Devices" on page 135.

To associate a VPrep shelf with a labware type:

1. Select **Tools** > **Manage Reagents**.
2. In the **Device** list box of the **Manage Reagents** dialog box, select a VPrep shelf.

   Only odd-numbered shelves appear in the list because these are not available to the robot and are therefore used to hold reservoirs.
3. In the **Reagent Name** text box, type a name for the association that you are creating,

   You can choose any name, but you may want to use the name of the liquid that you plan to use in the reservoir on this shelf.
4. In the **Labware Type** list box, select the type of labware to use on this shelf.



5. Click **OK**.
6. Repeat step 2 through step 5 for other VPrep shelves.
7. Select **File** > **Save**.

   !! IMPORTANT !! Each association is registered in VWorks after clicking OK and will be available for the run you are setting up. However, to save the change so it is available the next time you start VWorks session, you must save the protocol.

Managing Devices

Introduction

Before you can set parameters for many pipette tasks, you must first associate the labware that is used in the task with a labware type and a VPrep shelf.

To do this, you:

- ❑ Associate the labware used in the task with a labware type and device, using the Manage Reagents dialog box.
- ❑ Associate the device with a VPrep shelf using the device manager, which is described in this section.

The association created in the Manage Reagents dialog box is given a name that you will later select in the device manager, and again when you set the pipette task parameters.

Before continuing with the procedure in this section, read:

- ❑ "Understanding the Structure of Configuration Settings in a Pipette Task" on page 130
- ❑ "Managing Reagents" on page 133

Device Defined

A device is a:

- ❑ Specific module
- ❑ Location on the BioCel that can hold a piece of labware.

Examples of devices are:

- ❑ VPrep shelf 5
- ❑ VPrep
- ❑ QFill
- ❑ Plate pad 3
- ❑ Hotel - 15

About This Procedure

The procedure in this section explains how to associate a device with a VPrep shelf. Use this procedure when creating a protocol that involves a new liquid handling setup.

Before using this procedure follow the procedure in "Managing Reagents" on page 133.

Note: The device manager is used by Velocity11 personnel to configure other settings on your BioCel, but these configurations are not covered in this guide.

Procedure

To associate a device with a VPrep shelf:

1. Log in with the Velocity11 User Name.
2. Select **Tools > Manage Devices**.

   The device manager opens.
3. In the **Device Name** list box, select the name of the device that you want to associate.

   This should be the same as the **Reagent name** that you selected in the **Manage Reagents** dialog box. For more information, see "Managing Reagents" on page 133,
4. In the **Device type** list box, make sure that the correct description of the device is selected, for example, **Pipettor reagent shelf**.
5. Click **Specify allowed/prohibited labware**.
6. Make sure that the labware you intend to use on this VPrep shelf is in the **Labware classes allowed to use this device** column.

   If it is not, click the appropriate arrow head buttons to move the labware class into this column and click **OK**. For more information about the Labware library, see "Setting Labware and Liquid Parameters" on page 159.

Linking To a Pipette Process Task and VPrep

Background

Before reading this section you should be familiar with the definitions in "About Tasks, Processes and Protocols" on page 48.

When you add a Pipette Process task to a process in the protocol editor, a pipette process is automatically created in the pipette protocol editor.

Because you can have more than one pipette process, you must link each Pipette Process task with a specific pipette process. You do this by setting the parameter for the pipette process task.

You then link the pipette process to a particular VPrep.

Linking To a Pipette Process task

To link a Pipette Process task to a pipette process:

1. In the process editor, click to select the Pipette Process task.

2. In the **Task Parameters** toolbar, select the pipette process to link to.

Linking a Pipette Process to a VPrep

After linking the pipette process task to a pipette process, you link the pipette process to a particular VPrep.

To link a pipette process to a VPrep:

1. Click the **Pipette Process Editor** tab.
2. In the **Task Parameters** toolbar, select from the drop down list the VPrep that you want to perform this pipetting operation.

Types of Pipette Process Tasks

For more information about specific pipette process tasks, see:

- ❑ "Setting Aspirate Pipette Task Parameters" on page 138
- ❑ "Setting Dispense Pipette Task Parameters" on page 140
- ❑ "Setting Mix Pipette Task Parameters" on page 143
- ❑ "Setting Change Tips Pipette Task Parameters" on page 146
- ❑ "Setting Pump Reagent Pipette Task Parameters" on page 150
- ❑ "Setting Wash Tips Pipette Task Parameters" on page 152
- ❑ "Setting Dry Tips Pipette Task Parameters" on page 156

Setting Aspirate Pipette Task Parameters

Aspirate Pipette Task Defined

An Aspirate pipette task is used with a VPrep to draw up liquid from a plate or reservoir.

When To Use

Before using this procedure you should read and perform the necessary procedures in:

- ❑ "About Creating Protocols" on page 94
- ❑ "Understanding the Structure of Configuration Settings in a Pipette Task" on page 130
- ❑ "Managing Reagents" on page 133
- ❑ "Managing Devices" on page 135

Setting Aspirate Task Parameters

Having associated a VPrep shelf with the labware type that you will aspirate from, you can now set the Aspirate task parameters.

To set Aspirate task parameters:

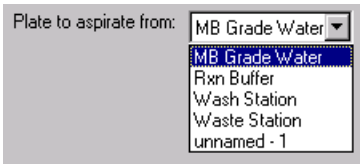
1. Add an Aspirate task icon to the pipette process editor window.
2. If you have defined a liquid class for the liquid you intend to aspirate, select it from the **Liquid class** list box at the bottom of the **Task Parameters** toolbar.

   For more information about creating liquid classes, see the *VStack User Manual*.
3. Complete the following fields:

Field	Description
Aspirate volume	The volume of liquid to be drawn up into each pipette tip.
Aspirate velocity	The rate at which to draw up the liquid. If you selected a liquid class, this value is entered automatically from the liquid library editor and cannot be edited here.
Aspirate acceleration	The rate of increase in velocity before the Aspirate Velocity is reached. If you selected a liquid class, this value is entered automatically from the liquid library editor and cannot be edited here.
Distance from well bottom	The distance between the bottom of the pipette tips and the bottoms of the plate wells. If you are using dynamic tip retraction this value sets the lowest point that the tips will travel to.

Field	Description
Tip retract distance	The distance that the tips should move downwards per unit volume of liquid being aspirated. This value allows the tips to move downwards during aspiration to maintain a certain height below the surface of the liquid. You will need to determine an appropriate value by trial-and-error for each type of plate you use. You might want this value to be the same as the Tip Retract Distance for the Dispense task.
Pre-aspirate volume	The volume of air to be drawn up before the pipette tips enter the liquid.
Post-aspirate volume	The volume of air to be drawn up after the liquid is drawn up.
Quadrant	A number from: ❑ 1–4 that represents the quadrant on a 384-well plate that you want a 96-well head to aspirate from ❑ 1–4 that represents the quadrant on a 1536-well plate that you want a 384-well head to aspirate from ❑ 1–16 that represents the quadrant on a 1536-well plate that you want a 96-well head to aspirate from

4. In the **Plate to Aspirate from** list box, select the name that you chose for the association in "Managing Reagents" on page 133.



This associates the VPrep shelf and plate type with the task.

If the name that you chose does not appear in this list it is because you associated the VPrep shelf with the labware type *after* adding the Aspirate pipette task to the pipette process. Remove the task and add it again for the choice to appear.

5. If you do not want to record this dispense in the transfer log, clear the **Record in transfer log** check box.

You might do this, for example, if you are running a casual test protocol.

For more information about the transfer log, see "Working with the Log Toolbar" on page 88.

Setting Dispense Pipette Task Parameters

Dispense Pipette Task Defined

A Dispense pipette task is used with a VPrep to dispense liquid to a plate.

When To Use

Before using this procedure you should read and perform the necessary procedures in:

- ❑ "About Creating Protocols" on page 94
- ❑ "Understanding the Structure of Configuration Settings in a Pipette Task" on page 130
- ❑ "Managing Reagents" on page 133
- ❑ "Managing Devices" on page 135

Dispense Value Limits

You cannot dispense more volume than you aspirated.

If you enter a total dispense volume that is greater than the total aspirate volume, you will get an error message when you compile the protocol. In other words, the Aspirate Volume + Pre-Aspirate Volume + Post-Aspirate Volume must be greater than, or equal to, the Dispense Volume + Blowout Volume + Post Dispense Volume.

Procedure

Having associated a VPrep shelf with the labware type that you will aspirate from, you can now set the Dispense task parameters.

To set Dispense task parameters:

1. In the pipette process window, click the Dispense task icon.
2. If you:
   - ◆ Have defined a liquid class for the liquid you intend to dispense, select it from the **Liquid class** list box at the bottom of the **Task Parameters** toolbar.
   - ◆ Want to create or modify a liquid class, click **Edit**.

     For more information about creating liquid classes, see the *VStack User Manual*.
3. Either:
   - ◆ Type the volume that you want to dispense in the **Dispense Volume** text box.
   - ◆ Select the **Empty tips** check box.

     Do this if you want to empty the tips rather than deliver a specific volume of liquid.
4. Complete the following fields:

Field	Description
Dispense velocity	The rate at which to dispense the liquid. If you selected a liquid class, this value is entered automatically from the liquid library editor and cannot be edited here.
Dispense acceleration	The rate of increase in velocity before the Dispense Velocity is reached. If you selected a liquid class, this value is entered automatically from the liquid library editor and cannot be edited here.
Distance from well bottom	The distance between the bottom of the pipette tips and the bottoms of the plate wells. If you are using dynamic tip retraction this value sets the lowest point that the tips will travel to.
Retract distance	The distance that the tips should move upwards per unit volume of liquid being dispensed. This value allows the tips to move upwards during dispensing to maintain a certain height above the surface of the liquid. You will need to determine an appropriate value by trial-and-error for each type of plate you use. You might want this value to be the same as the Tip Retract Distance for the Aspirate task.
Blowout volume	The volume of air to blow out when the tips are in the liquid. This is typically the same as the pre-aspirate volume of the Aspirate task.
Post-dispense volume	The volume of air to blow out when the tips are out of the liquid.

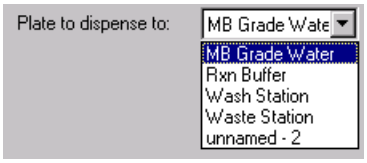
Field	Description
Quadrant	A number from: ❑ 1–4 that represents the quadrant on a 384-well plate that you want a 96-well head to dispense to ❑ 1–4 that represents the quadrant on a 1536-well plate that you want a 384-well head to dispense to ❑ 1–16 that represents the quadrant on a 1536-well plate that you want a 96-well head to dispense to If you want to dispense into a plate with more wells than you aspirate from you will need to set up a series of aspirate-dispense task pairs. Each pair will dispense into a different quadrant.

5. If you want the tips to touch one or more sides of the plate wells:
   a. Select the **Enable tip touching** check box.
   b. Type a value for the **tip touch rise height**.

      This is the height that the tips should move upwards before touching the side of the wells.
   c. Type a value for the **Tip touch horizontal distance**.

      When the value for this parameter is zero, the tips will move horizontally one well radius. The well radius is defined in the labware database for the type of plate you are using. If you want the tips to touch harder, increase this value. If you want the tips to touch more lightly, enter a negative value.

      For more information about using the labware editor to add or modify labware definitions, see the *VPrep User Manual*.
   d. Type a value for the number of well sides to touch.
6. In the **Plate to dispense to** list box, select the name that you chose for the association in "Managing Reagents" on page 133.



   If the name that you chose does not appear in this list it is because you associated the VPrep shelf with the labware type *after* adding the Dispense pipette task to the pipette process. Remove the task and add it again for the choice to appear.
7. If you do not want to record this dispense in the transfer log, clear the **Record in transfer log** check box.

   You might do this, for example, if you are running a casual test protocol.

Setting Mix Pipette Task Parameters

Mix Pipette Task Defined

A Mix pipette task is used with a VPrep to mix reagents by aspirating and then dispensing.

When To Use

Before using this procedure you should read and perform the necessary procedures in:

- ❑ "About Creating Protocols" on page 94
- ❑ "Understanding the Structure of Configuration Settings in a Pipette Task" on page 130
- ❑ "Managing Reagents" on page 133
- ❑ "Managing Devices" on page 135

Procedure

Having associated a VPrep shelf with the labware type that you will aspirate from, you can now set the Mix task parameters.

To set Mix pipette task parameters:

1. In the pipette process window, click to select the Mix task icon.
2. If you:
   - ◆ Have defined a liquid class for the liquid you intend to mix, select it from the **Liquid class** list box at the bottom of the **Task Parameters** toolbar.
   - ◆ Want to create or modify a liquid class, click **Edit**.

     For more information about creating liquid classes, see the *VStack User Manual*.
3. Complete the following fields:

Field	Description
Mixing volume	The volume of liquid to be aspirated and dispensed to each plate well.
Number of mixing cycles	The number of aspirate/dispense operations.
Aspirate velocity	The rate at which to draw up the liquid. If you selected a liquid class, this value is entered automatically from the liquid library editor and cannot be edited here.
Aspirate acceleration	The rate of increase in velocity before the Aspirate Velocity is reached. If you selected a liquid class, this value is entered automatically from the liquid library editor and cannot be edited here.

Field	Description
Dispense velocity	The rate at which to dispense the liquid. If you selected a liquid class, this value is entered automatically from the liquid library editor and cannot be edited here.
Dispense acceleration	The rate of increase in velocity before the Dispense Velocity is reached. If you selected a liquid class, this value is entered automatically from the liquid library editor and cannot be edited here.
Distance from well bottom	The distance between the bottom of the pipette tips and the bottoms of the plate wells. If you are using dynamic tip retraction this value sets the lowest point that the tips will travel to.
Retract distance	The distance that the tips should move upwards or downwards per unit volume of liquid being dispensed or aspirated. This value allows the tips to move upwards or downwards during dispensing or aspirating to maintain a certain height below or above the surface of the liquid. You will need to determine an appropriate value by trial-and-error for each type of plate you use.
Pre-aspirate volume	The volume of air to be drawn up before the pipette tips enter the liquid, and before mixing begins.
Last-cycle blowout volume	The volume of air to blow out when the tips are in the liquid once the mixing is complete. This is typically the same as the pre-aspirate volume.
Quadrants	A number from: ❑ 1–4 that represents the quadrant on a 384-well plate that you want a 96-well head to dispense into ❑ 1–4 that represents the quadrant on a 1536-well plate that you want a 384-well head to dispense into ❑ 1–16 that represents the quadrant on a 1536-well plate that you want a 96-well head to dispense into

4. If you want the tips to touch one or more sides of the plate wells:
   a. Select the **Enable tip touching** check box.

This is the height that the tips should move upwards before touching the side of the wells.

b. Type a value for the **tip touch rise height**.

This is the height that the tips should move upwards before touching the side of the wells.

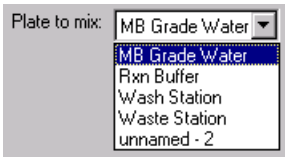
c. Type a value for the **tip touch horizontal distance**.

When the value for this parameter is zero, the tips will move horizontally one well radius. The well radius is defined in the labware database for the type of plate you are using. If you want the tips to touch harder, increase this value. If you want the tips to touch more lightly, enter a negative value.

For more information about using the labware editor to add or modify labware definitions, see the *VStack User Manual*.

d. In the **Number of sides to touch** text box, type a value for the number of sides of the wells that you want the tips to touch.

5. In the **Plate to mix** list box, select the name that you chose for the association in "Managing Reagents" on page 133.



If the name that you chose does not appear in this list it is because you associated the VPrep shelf with the labware type *after* adding the Mix pipette task to the pipette process. Remove the task and add it again for the choice to appear.

Setting Change Tips Pipette Task Parameters

Change Tips Pipette Task Defined

The Change Tips pipette task uses the robot to apply or remove VPrep pipette tips.

Pairs of Change Tips tasks are usually used together. For example, if the protocol starts with tips already on the VPrep, the first Change Tips task would remove the tips and the second Change Tips task would install new tips.

Change Tips tasks are always used as part of a whole process created for the sole purpose of changing tips, an example of which is described in this section.

Requirements

To be able to change tips automatically on the BioCel you need a:

- ❑ Lid removal station for tipbox lids.

  For more information about the lid removal station, see ”Lid Removal Station” on page 36.
- ❑ Tipbox shelf configured on your VPrep.

  Configuration of VPrep shelves is performed through the device manager and should be performed by Velocity11 personnel. For more information, see ”Managing Devices” on page 135.
- ❑ Tipbox, containing tips, that is in a robot-accessible position, typically in a VStack.

Also, if you are removing tips first, you will need an empty tipbox on the tipbox shelf of the VPrep you intend to use for the operation.

When To Use

Before using the procedure in this section you should read and perform the necessary procedures in:

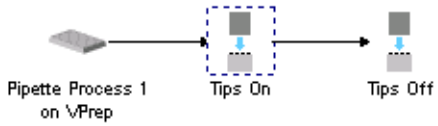
- ❑ ”About Creating Protocols” on page 94
- ❑ ”Understanding the Structure of Configuration Settings in a Pipette Task” on page 130
- ❑ ”Managing Reagents” on page 133
- ❑ ”Managing Devices” on page 135

Overall Process

The overall process of changing tips on a VPrep is:

1. Create a process for the tipbox, such as in the following example.

2. Create a pipette process to change tips, such as in the following simple example.



Creating the Process For the Tipbox

Before you can add a Change Tips pipette task, you must create a process for the tipbox that will contain the tips.

Creating a process for the tipbox:

1. Click the **Protocol Editor** tab.
2. Click **Add**.

   A plate definition icon appears in the protocol editor window.
3. If the **Task Parameters** toolbar is not showing, select **View > Toolbars > Protocol Parameters**.
4. In the **Task Parameters** toolbar:
   a. Type a name for the plate in the **Plate Name** text box.
   b. In the **Plate type** list box, select the tipbox that has already been configured for use on the shelf of the VPrep that you intend to use.

      Configuration of VPrep shelves is performed through the device manager. For more information about the device manager, see "Managing Devices" on page 135.

      When you select a tipbox, Stacker, Pipette process and Waste tasks are automatically added.
   c. In the **Simultaneous Plates** text box, type the maximum number of plates of this type that you want to be available to the system at one time.

      For advice on how to set the the number of simultaneous plates, see "Setting the Number of Simultaneous Plates" on page 98.
   d. If the tipboxes have lids, select the **Plates have lids** check box.

      !! IMPORTANT !! If this option is not selected and the tipbox has a lid, the VPrep head will crash into the

tipbox lid and return a Z-axis position error that will require a recovery procedure.

e. Leave the **Plates enter the system sealed** check box clear.

f. If the tipboxes have a bar code on the south side, select the first **Incoming plates have a barcode**... check box.

g. In the **Bar Code Control** group box, select one or more of the options if you want bar codes on the tipboxes to be read and compared with a bar code data file during a run.

All BioCels can read south side bar codes. To read bar codes on other sides a VCode with bar code reader, platepad bar code reader, or VPrep bar code reader shelf are required. If you want the bar codes on the incoming plates to be compared with a bar code data file when they enter the system, select the file from the list box.

h. If the tipboxes have a bar code on the west side, select the second **Incoming plates have a barcode**... check box.

For more information about bar code data files, see "Setting Bar Code Task Parameters" on page 108.

5. Set the Stacker task parameters.

For more information about setting Stacker task parameters, see "Setting Stacker Task Parameters" on page 103.

6. Set the Pipette Process task parameters.

7. If you only intend to add tips during this process, delete the **Waste** task.

For more information about deleting a task, see "Deleting a Task" on page 99.

8. Add any other tasks that you want to for the tipbox.

You could, for example, add a Barcode task to place a bar code on the tipbox.

Creating the Pipette Process

After you have created a process for the tipbox, you can create a pipette process for the Change Tips task.

To create a pipette process for changing tips:

1. Click the **Pipette Process Editor** tab.
2. Drag a Change Tips task to the pipette process window.
3. In the **Task Parameters** toolbar, select either:

Option	With This Option, During the Protocol...
Press On New Tips	❑ If the tipbox has a lid, it is removed. ❑ For all tipboxes, the box is moved to the tipbox shelf on a VPrep module and the tips are pushed onto the VPrep head. ❑ The tipbox remains on the the VPrep shelf for temporary storage.
Tips off	❑ The tips are ejected from the VPrep head into the tipbox on the tipbox shelf. ❑ The tipbox is moved to the waste.

4. From the list box, select the name of the tipbox that you assigned in the section "Creating the Process For the Tipbox" on page 147.
5. Add other pipette tasks, including a second Change Tips task, as required.

Setting Pump Reagent Pipette Task Parameters

Pump Reagent Task Defined

The Pump Reagent pipette task is used on a VPrep to pump liquid into an installed autofilling reservoir. Reservoirs are typically filled with washing buffer or water, and drained through the gravity drain.

When To Use

Before using the procedure in this section you should read and perform the necessary procedures in

- ❑ "About Creating Protocols" on page 94
- ❑ "Understanding the Structure of Configuration Settings in a Pipette Task" on page 130
- ❑ "Managing Reagents" on page 133
- ❑ "Managing Devices" on page 135

For the steps required before performing this procedure, see "About Creating Protocols" on page 94.

If you are using an autofilling reservoir, you should also calibrate the reservoir on the WeighShelf. The calibration sets 100% as the weight of a full reservoir and 0% as the weight of an empty reservoir.

For more information about calibrating a reservoir on a WeighShelf, see the *VPrep User Manual*.

Procedure

To fill a VPrep reservoir:

1. In the pipette process window, click the **Pump Reagent** icon.
2. In the **Task Parameters** toolbar, select **Fill**.

   You can use the **Empty** option to pump liquid out of a reservoir. To do this you must complete the **Autofill Configuration** information on the **Shelf** tab of the VPrep Diagnostics software. For more information, see the *VPrep User Manual*.
3. In the list box, select the shelf on which the reservoir is located.
4. In the **for** text box, type the the pumping duration.
5. In the **at** text box, type the percentage of maximum pumping rate.
6. In the **every** text box, type a number that controls how frequently the liquid is pumped.

   For example, if you type 3, the pump will run every third time the task runs.
7. In the **Min level** text box, enter the minimum percentage of liquid that you want the reservoir to contain.

   A typical value is 45%.

8. In the **Max level** text box, enter the maximum percentage of liquid that you want the reseroir to contain.

   A typical value is 60%.

Setting Wash Tips Pipette Task Parameters

Wash Tips Pipette Task Defined

A Wash Tips pipette task is used with a VPrep to wash pipette tips. It is typically used with MicroWash tray.

If you are using a MicroWash tray, this task can also be used to wash the MicroWash tray manifold.

For more information about MicroWash trays, see the *VPrep User Manual*.

When To Use

Before using the procedure in this section you should read and perform the necessary procedures in:

- ❑ "About Creating Protocols" on page 94
- ❑ "Understanding the Structure of Configuration Settings in a Pipette Task" on page 130
- ❑ "Managing Reagents" on page 133
- ❑ "Managing Devices" on page 135

Washing Pipette Tips

Having associated a VPrep shelf with the labware type that you will aspirate from, you can now set the Wash Tips task parameters.

To wash pipette tips:

1. If you have defined a liquid class for the liquid you intend to use for washing, select it from the **Liquid class** list box at the bottom of the **Task Parameters** toolbar.

   For more information about creating liquid classes, see the *VPrep User Manual*.

2. Complete the following fields:

Field	Description
Wash Volume	The volume of liquid to be aspirated and dispensed to each plate well.
Number of wash cycles	The number of aspirate/dispense operations.
Aspirate velocity	The rate at which to draw up the liquid. If you selected a liquid class, this value is entered automatically from the liquid library editor and cannot be edited here.
Aspirate acceleration	The rate of increase in velocity before the Aspirate Velocity is reached. If you selected a liquid class, this value is entered automatically from the liquid library editor and cannot be edited here.

Field	Description
Dispense velocity	The rate at which to dispense the liquid. If you selected a liquid class, this value is entered automatically from the liquid library editor and cannot be edited here.
Dispense acceleration	The rate of increase in velocity before the Dispense Velocity is reached. If you selected a liquid class, this value is entered automatically from the liquid library editor and cannot be edited here.
Distance from well bottom	The distance between the bottom of the pipette tips and the bottoms of the MicroWash tray chimneys.
Retract Distance	The distance that the tips should move upwards or downwards per unit volume of liquid being dispensed or aspirated. This value allows the tips to move upwards or downwards during dispensing or aspirating to maintain a certain height below or above the surface of the liquid. You will need to determine an appropriate value by trial-and-error.
Pre-aspirate volume	The volume of air to be drawn up before the pipette tips enter the liquid, and before mixing begins.
Last-cycle blowout volume	The volume of air to blow out when the tips are in the liquid once the mixing is complete. This is typically the same as the pre-aspirate volume.
Quadrant	A number from: ❑ 1– 4 that represents the quadrant on a 384-well plate that you want a 96-well head to dispense into ❑ 1– 4 that represents the quadrant on a 1536-well plate that you want a 384-well head to dispense into ❑ 1– 16 that represents the quadrant on a 1536-well plate that you want a 96-well head to dispense into If you are using a 96-chimney MicroWash tray, enter the number 1.
Inflow pump	The relative rate of liquid flow into the MicroWash tray manifold. This value should be high enough for the washing liquid to just bubble over the tops of the chimneys.

Field	Description
Outflow pump	The relative rate of liquid flow out of the MicroWash tray manifold. This value should be zero.

3. If you want to dispense the wash liquid to waste instead of dispensing it back into the reservoir of washing liquid:
   a. Select the **Dispense to waste at height of** check box.
   b. Type a value into the associated text box for the height above the chimney from which you want the liquid to be dispensed.

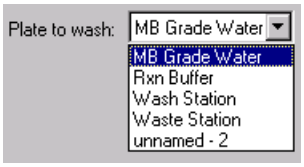
      The value can be a positive or negative number.

      The pipette tips move up and sideways to dispense the wash liquid between the chimneys into waste.
4. If you want the tips to touch the outside tops of the chimneys to remove drops from the tips:
   a. Select the **Enable tip touching** check box.

      This is the height that the tips should move upwards before touching the side of the wells.
   b. Type a value for the **Tip touch horizontal distance**.

      When the value for this parameter is zero, the tips will move horizontally one well radius. The well radius is defined in the labware database for the type of plate you are using. If you want the tips to touch harder, increase this value. If you want the tips to touch more lightly, enter a negative value.

      For more information about using the labware editor to add or modify labware definitions, see the *VStack User Manual*.
5. In the **Plate to wash** list box, select the VPrep and shelf position of the MicroWash tray.



If the name that you chose does not appear in this list it is because you associated the VPrep shelf with the labware type *after* adding the Wash tips pipette task to the pipette process. Remove the task and add it again for the choice to appear.

Washing the MicroWash Tray Manifold

To wash the MicroWash tray manifold:

1. Create a process that contains only a pipette process.
2. Add a Wash Tips task to the pipette process.
3. Enter the following values for the task:

Field	**Value**
Wash volume	0
Number of wash cycles	0
Inflow pump	*Variable*
Outflow pump	*Same as Inflow pump*

4. Run the process.

Setting Dry Tips Pipette Task Parameters

Dry Tips Pipette Task Defined

The Dry Tips task is used with a tip dryer on a VPrep with a fixed-tip head to dry the pipette tips.

There are two phases to drying:

- ❑ Initial

  Rapidly raises the temperature from ambient to a temperature suitable for drying.

- ❑ Final

  Maintains a suitable drying temperature.

The goal when setting Dry Tips task parameters is to raise the temperature quickly for a short time and then apply less heat to dry the tips.

Procedure

Use this procedure when creating a protocol.

To set Dry Tips task parameters:

1. Complete the following fields:

Field	Description
Initial heat	Percentage of the maximum heat.
Initial heat time	Time for which to apply the initial heat.
Final heat	Percentage of the maximum heat.
Final heat time	Time for which to apply the final heat, starting when the initial heat time ends.

Administrator Procedures

5

This chapter is intended for people with Administrator privileges. It covers how to administer user accounts, edit labware definitions and collect plate reader data. It also covers how to use the safety interlock override.

Creating a User Account

Introduction

Administrators create accounts to enforce privileges for different levels of users.

For more information about privileges, see "User Accounts and Privileges" on page 47.

Procedure

To create a user account:

1. Select **Tools** > **Manage Users**.
2. In the **User Editor** dialog box, click **Add**.
3. In the **User Name** text box, type a name for the user.
4. From the **Access Level** list box, select the privilege that you want to assign to the user.
5. Assign a password:
   a. Click **Change Password**.
   b. Enter a password in the **New** text box.
   c. Re-type the password in the **Confirm New** text box.
   d. Click **OK**.
6. Click **OK**.

!! IMPORTANT !! If you do not assign a password, a blank password will automatically be assigned. This means that anybody can log in to VWorks™.

Setting Labware and Liquid Parameters

Introduction

The BioCel® software includes a:

- ❑ Labware database
- ❑ Liquid library database

These databases are maintained in the Windows® registry editor and are accessed using the labware editor and the liquid library editor.

The databases on your BioCel already contain most of the information you need. If you want to use new types of labware or new liquids, or want to optimize settings that are already defined in the databases, you will need to work with the labware editor or liquid library editor.

Labware Editor

The labware editor is used to define the detailed dimensions of microplates, tipboxes, pin tools, and so on. These dimensions are needed by the robot and VPrep® for accurate plate manipulation.

To open the labware editor from VWorks:

1. In the main VWorks window, click **Diagnostics**.
2. In the VWorks Diagnostics window, click **Labware Editor**.

For more information about using the labware editor, see "Understanding the Structure of Configuration Settings in a Pipette Task" on page 130 and the *VStack User Manual*.

Liquid Library Editor

The liquid library editor is used to set parameters that affect pipetting accuracy and precision.

To open the liquid library editor from VWorks:

1. Create a process that contains a Pipette Process task.

   For more information about creating a process, see "About Creating Protocols" on page 94.
2. Click the **Pipette Process Editor** tab.
3. Click the Aspirate pipette process task and drag it to the pipette process window.

   You can also use the Dispense, Mix and Wash Tips tasks.
4. In the **Task Parameters** toolbar, click **Edit**.

   The liquid library editor opens.

For more information about using the liquid library editor, see "Understanding the Structure of Configuration Settings in a Pipette Task" on page 130 and the *VPrep User Manual*.

Copying a Registry Key

The same Labware database and Liquid Library database are accessed from VPrep's PrepWorks software and VWorks software, so a change made from within VWorks will also be available from PrepWorks. However, if you want to move changes that you made on the BioCel to a VPrep or VStack® that is working in stand-alone mode, you will need to copy the Windows registry keys that contain the data to the stand-alone computer.

To copy a Windows registry key:

1. From the Windows **Start** menu, select **Run**.
2. In the **Open** text box, type `regedit`.
3. Click **OK**.

   The Windows registry editor opens.
4. Expand folders to display the following folder:

   HKEY_LOCAL_MACHINE\SOFTWARE\Velocity11\Shared
5. Expand the Shared folder and select either:
   - Labware
   - Liquid Library
6. From the **Registry** menu, select **Export Registry** File.

   The **Export Registry File** browse box opens.
7. Navigate to the folder in which you want to save the file.
8. In the **File name** text box, type a name of your choice for the file.
9. If you are moving the file to a computer with a different operating system, select the appropriate recipient operating system from the **Save as type** list box, if one is available.
10. Click **Save**.
11. Select **Registry > Exit** to close the registry editor.
12. Move the file to the recipient computer.
13. On the recipient computer:
    a. From the Windows **Start** menu, select **Run**.
    b. In the **Open** text box, type `regedit`.
    c. Select **Registry > Import Registry File**.
    d. Navigate to, and select, the registry file.
    e. Click **Open**.
    f. Click **OK** in the confirmation message box.

Ultramark Plate Reader Data

Introduction

The Ultramark plate reader measures the absorbance of samples in microplate wells.

Data File Output Format

Absorbance data is stored in a comma separated data file, which can later be imported into a spreadsheet.

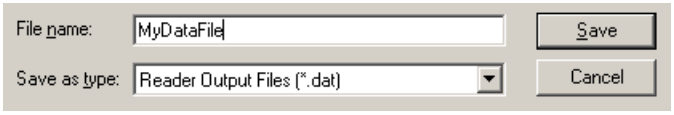
Data File Folder

If your BioCel has an Ultramark plate reader, you must define where you want plate reader data files to be stored.

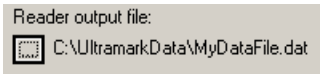
To set the data file output folder:

1. Select **Tools** > **Options**.
2. In the **VWorks Options** dialog box, click the **Log Options** tab.
3. Click the **Reader output file** ellipsis button.

4. Navigate to the folder in which you want to store the data file.
5. Enter a filename, but leave off the extension.



6. Click **Save** and make sure that the correct file path is displayed.



7. Click **OK**.

Network Cards

Introduction

You may need to provide some of the information in this section to your network administrator for your BioCel to be connected to your company's network.

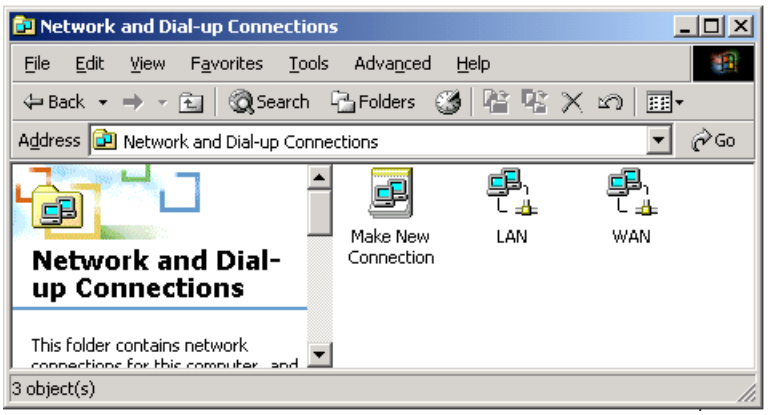
Your BioCel has two network cards. The network connections for these cards are named WAN and LAN.

Network Connections

To see the network connections in Windows:

1. In Windows, from the **Start** menu select **Settings > Control Panel**.
2. Double click the Network and Dial Up Connections icon.

   The Network and Dial-up Connections window opens.



LAN Network Card

The LAN network card is used for communication between the computer and modules that use Ethernet communication cable. This network is considered to be the local area network.

The LAN network card has a fixed IP address, which is 192.168.0.1.

WAN Network Card

The WAN network card is for networking with your company's network. The settings for this card should be configured by your network administrator in the same way that any PC would be configured to make it available to your network.

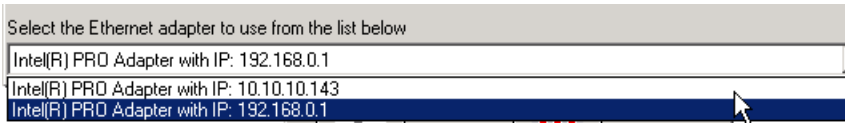
The WAN network card has an IP address that is dynamically assigned by your domain name server when you start your BioCel's computer.

Network IP Addresses

To see the IP addresses of the two network cards:

1. In VWorks, click **Diagnostics**.
2. Click the VStack icon.
3. Click the drop-down arrow for the **Select the Ethernet adapter to use**... list box.

   !! IMPORTANT !! Make sure that you do not change the selected IP address when you do this. VStacks should be always be connected to the LAN network with the 192.168.0.1 IP address.


Select the Ethernet adapter to use from the list below
Intel(R) PRO Adapter with IP: 192.168.0.1
Intel(R) PRO Adapter with IP: 10.10.10.143
Intel(R) PRO Adapter with IP: 192.168.0.1

Using Diagnostics Software

6

This chapter explains how to use diagnostics software to control the robot and modules.

About Diagnostics Software

Background

The robot and every module used with the BioCel® can be controlled independently of VWorks™ using diagnostics software. Diagnostics software communicates directly with modules using simple commands.

Diagnostics software is used for:

- ❑ Troubleshooting
- ❑ Setting teachpoints
- ❑ Performing manual operations outside a protocol

  For example, if an error occurs during a run that leaves a plate where it should not be and the VStack® stage out of its home position, you can use Robot Diagnostics to move the plate and VStack Diagnostics to return the VStack stage to its home position.

For more information about teachpoints, see "Fine-Tuning Robot Teachpoints" on page 175.

Opening Diagnostics Software

To open a diagnostics software program:

1. In VWorks, click **Diagnostics**.

2. In the **BioCel Diagnostics** window, click the icon for the diagnostics program that you want to open.

Where To Find Diagnostics Instructions

Most modules manufactured by Velocity11® include diagnostics software that is specific for the module. You can find instructions for using this software in the relevant user guide.

Diagnostics software for third-party modules has been developed by Velocity11, and you can find instructions for this software in this section of the guide.

For more information, see:

- ❑ "Using Robot Diagnostics Software" on page 167
- ❑ "Using QFill Diagnostics Software" on page 180
- ❑ "Using Bio-Tek Diagnostics Software" on page 182
- ❑ "Using iSeries Diagnostics Software" on page 185

Using Robot Diagnostics Software

About This Section

This section explains how to move the robot using Robot Diagnostics software. For general information about diagnostics software, and to learn how to open diagnostics software, see "About Diagnostics Software" on page 166.

!! DAMAGE HAZARD !! Before you use Robot Diagnostics software to move the robot, make sure that there is nothing on the table that the robot can crash into. Move the robot slowly.

Robot Axes

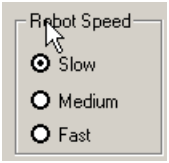
The robot has three axes of movement:

Axis	Description
R	Radius. R value is the horizontal distance, in millimeters, between the back of the robot's gripper in the home position and the back of the robot's gripper in the current position.
T	Angle. T (theta) value is the angle, in degrees, between the center point of the robot's gripper in the home position and the center point of the robot's gripper in the current position.
Z	Height. Z value is the vertical distance, in millimeters, between the center point of the robot gripper at the home position and the center point of the robot gripper at the current position.

Setting Robot Speed

To set the speed of robot movement:

1. In the **Robot Speed** group box, select **Slow**, **Medium**, or **Fast**.

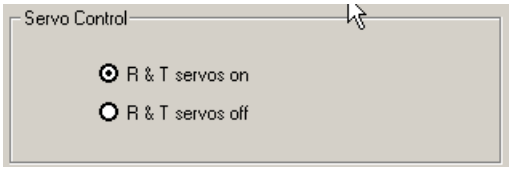


Moving the Robot by Hand

Robot movement is controlled by motor servos. You can move the robot by hand in the plane of the robot arm, but you cannot change its height.

To move the robot by hand:

1. In the **Servo control** group box, select **R & T Servos Off**.



2. Holding the end effector, which is the last segment of the arm, slowly move the arm to where you want it.
3. Select **R & T Servos On** to return control to VWorks.

Jogging the Robot

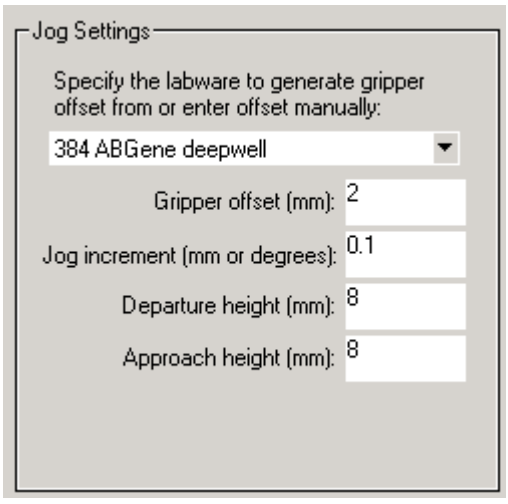
You can move the robot in increments, in either the Z, R, or T axes. The process of moving in increments is called jogging.

!! DAMAGE HAZARD !! Before you jog the robot, make sure that there is nothing on the table that the robot can crash into. Move the robot slowly and keep the jog increment small until you are certain that there is no obstruction.

To jog the robot:

1. If you intend to pick up a plate, in the **Jog Settings** group box select a type of labware from the list box, in which case the appropriate value is automatically entered into the **Gripper offset** text box.

   The gripper offset is the height above the teachpoint, which is typically 2–3 mm.


Jog Settings
Specify the labware to generate gripper offset from or enter offset manually:
384 ABGene deepwell
Gripper offset (mm): 2
Jog increment (mm or degrees): 0.1
Departure height (mm): 8
Approach height (mm): 8

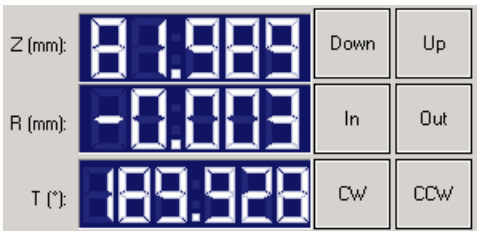
   You will rarely need to change the value for the gripper offset from the values automatically entered for the plate type. However, you can type a value into the **Gripper offset** text box if you need to.

2. Check, and possibly change, the following settings:

Setting	Comments
Jog increment	The distance or angle to move the robot at each jog.
Departure height	The height to raise the robot gripper above the teachpoint when robot moves the plate horizontally away from the pick position. Make this value large enough to avoid catching the plate on a lip, or other protuberance, as it is moved to, or from, a position, but not so high that it hits a shelf or other object above the position. This value is device-dependent. For most devices a value of 8–10 mm will work. Start with a value of 6 mm for picking a tipbox from a VPrep® shelf when making these settings. **!! DAMAGE HAZARD !! If this value is set incorrectly, it could result in a robot crash.**
Approach height	The height to raise the robot gripper above the teachpoint when the robot moves the plate horizontally towards the place plate position. Make this value large enough to avoid catching the plate on a lip, or other protuberance, as it is moved to or from a position, but not so high that it hits a shelf or other object above the position. This value is device-dependent. For most devices a value of 8–10 mm will work. Start with a value of 6 mm for picking a tipbox from a VPrep shelf when making these settings **!! DAMAGE HAZARD !! If this value is set incorrectly, it could result in a robot crash.**

3. In the **Position Control** group box, click one of the following buttons:

Button	Moves the robot...
Down	Down, decreasing the Z-axis value
Up	Up, increasing the Z-axis value
In	In towards the center of the robot's radius, decreasing the R-axis value
Out	Out from the center of the robot's radius, increasing the R-axis value
CW	Clockwise, decreasing the T-axis value
CCW	Counterclockwise, increasing the T-axis value



This jogs the robot by the selected increment in the selected direction.

The readout displays the current coordinates of the robot in relation to the home position.

Moving the Gripper

You can open and close the robot's gripper in a single movement.

To open or close the robot's gripper:

1. In the **Position Control** group box, click **Open gripper** or **Close gripper**.

Homing and Resting the Robot

Homing and resting the robot move the robot to the home position, but there are some important differences between these two actions.

Homing

Each axis of the robot has a sensor that is triggered when the robot is in a specific position. This position defines the home position for that axis.

When the robot is homed, it moves the R-axis, followed by the T-axis and then the Z-axis until the sensors on each axis are in the triggered position. This home position serves as a positional reference for all other points, with Z, R, T coordinates of 0, 0, 0.

You should home the robot after a high speed crash. The robot homes automatically when you start VWorks.

Resting

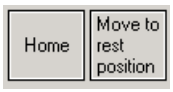
When the robot is moved to the rest position, it takes the shortest path to the Z, R, T coordinates of 0, 0, 0. Provided the home coordinates have not changed, this position is the same as the home position.

Resting the robot is faster than homing the robot because all axes move simultaneously and the arm moves faster because it is not using the sensors.

You may choose to move the robot to the rest position to quickly move it out of the way when you are working on the table.

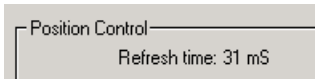
To home or rest the robot:

1. Click **Home** or **Move to rest position**.



Checking Communication Time

The Position Control group box displays the time interval between the receipt of positional coordinates from the robot. This refresh time should be less than 45 milliseconds. If it is consistently greater than this, contact the Velocity11 Service Center.

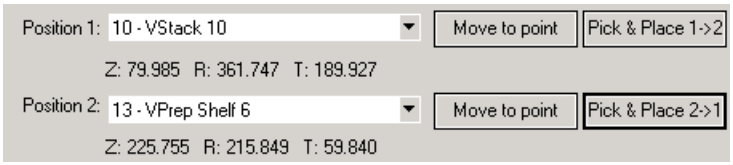


Reading a Plate's Bar Code

You can use diagnostics software to read a plate's bar code for troubleshooting purposes.

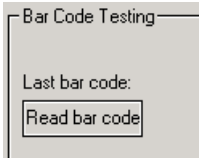
To read a plate's bar code:

1. Place the plate with the bar code on a platepad.
2. Select the platepad in the **Position 1** list box.


Position 1: 10 - VStack 10
Move to point
Pick & Place 1->2
Z: 79.985 R: 361.747 T: 189.927
Position 2: 13 - VPrep Shelf 6
Move to point
Pick & Place 2->1
Z: 225.755 R: 215.849 T: 59.840

3. In the **Position 2** list box, select **Nowhere**.
4. Click **Pick & Place 1->2**.

   The robot moves to the platepad and picks up the plate.
5. In the **Bar Code Testing** group box, click **Read bar code**.



   The bar code is read and displayed in the **Bar Code Testing** group box.

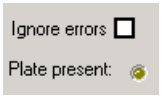
Ignoring Robot Errors

You have the option of ignoring robot errors when using Robot Diagnostics. You may choose to do this, for example, when you want to simulate the movement of plates without using plates, which would otherwise give a plate sensor error.

This setting only affects the use of Robot Diagnostics. It does not affect VWorks error settings.

To ignore errors when using Robot Diagnostics:

1. Select **Ignore errors**.



For more information about robot errors, see "Resolving Robot Errors" on page 194.

Checking the Plate Sensor

The plate sensor in the robot gripper may need to be recalibrated if it is not sensing a plate when there is a plate in the gripper.

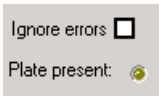
The plate sensor indicator in the Robot Diagnostics is used by Velocity11 service staff to help in the recalibration. You can also use it to check the function of the plate sensor.

To check the plate sensor:

1. Move the robot to a position that has a plate.

   For more information, see "Moving the Robot To a Teachpoint" on page 173.
2. Close the gripper.
3. Look at the **Plate present** indicator.

   If the indicator is on, the plate sensor is registering a plate in the gripper.

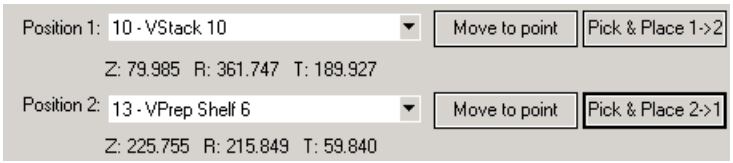


Moving the Robot To a Teachpoint

You can move the robot directly to any teachpoint when there is no plate in the gripper.

To move the robot to a teachpoint:

1. From the **Position 1** or **Position 2** list box, select the teachpoint to move to.



2. Click **Move to point** for either **Position 1** or **Position 2**, as appropriate.

!! DAMAGE HAZARD !! When you use the Move to point function, the robot does not use the Approach height or Departure height. Instead, it moves to the point using the most direct path. If there is a plate in the gripper, the plate may contact a lip on the device, causing a robot crash.

Moving a Plate Between Teachpoints

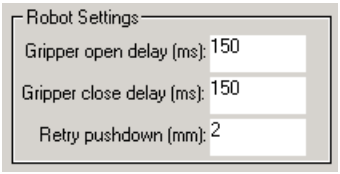
You can move the robot from one teachpoint to another, and then back again. If the first teachpoint has a plate, the robot will pick it up and move it to the second teachpoint.

To move a plate between teachpoints:

1. Select one teachpoint from the **Position 1** list box.
2. Select the other teachpoint from the **Position 2** list box.
3. To move a plate from:
   - Position 1 to Position 2, click **Pick & Place 1->2**
   - Position 2 to Position 1, click **Pick & Place 2->1**

Changing Robot Settings

You should rarely, if ever, need to change the robot settings.



!! IMPORTANT !! If you change the robot settings and later click Save & Exit, the values are changed in VWorks, which will affect protocols that you run afterwards.

To change robot settings:

1. Type the new value into the text box for the parameter you want to change, using the following table as a guide.

Parameter	Description
Gripper open delay	Interval between the time the gripper starts to open and the time the robot starts to depart from a plate. If this value is set too low, the gripper may not have completely released the plate before the robot moves, causing the plate to be dragged.
Gripper close delay	Interval between the time the robot reaches the teachpoint and the time the gripper starts to close. If this value is set too low, the plate is held too high in the gripper.
Retry pushdown	Pushdown is a robot action used with filtration stations, vacuum platepads and vacuum shelves on VPreps. The purpose of the action is to flatten a plate on the stage. It is used with thin plates that tend to warp. If, during operation, the vacuum seal indicator indicates the absence of a seal, the robot will push down on the plate in an attempt to create a seal. The value for this parameter is the number of times the robot will push down on a plate that has no vacuum seal before an error is returned.

Fine-Tuning Robot Teachpoints

About Teachpoints

Teachpoints are axis position coordinates needed by:

- ❑ The robot, to be able to accurately pick up and move plates to and from devices
- ❑ VPrep heads, to be able to accurately position pipette tips into plate wells
- ❑ VSpin™ centrifuges, to be able to accurately position the buckets in relation to the door
- ❑ VStack stackers, to be able to accurately position the plate stage during operation

Teachpoint coordinates are relative to the robot's or module's home position. They are set up by Velocity11 before shipping and verified at your site on installation. However, you may occasionally need to fine-tune teachpoints.

For information about module teachpoints, see the relevant user manual. This section covers only robot teachpoints.

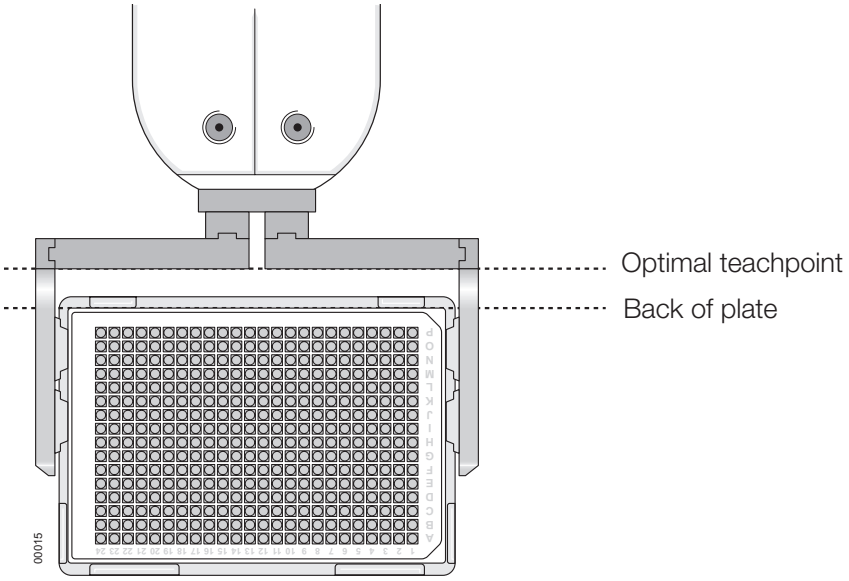
About Robot Teachpoints

Teachpoints are initially set at the factory using a custom teachpoint plate calibration tool. Each teachpoint is then fine-tuned as necessary. You should not need to create new teachpoints, but you may occasionally need to fine-tune existing teachpoints.

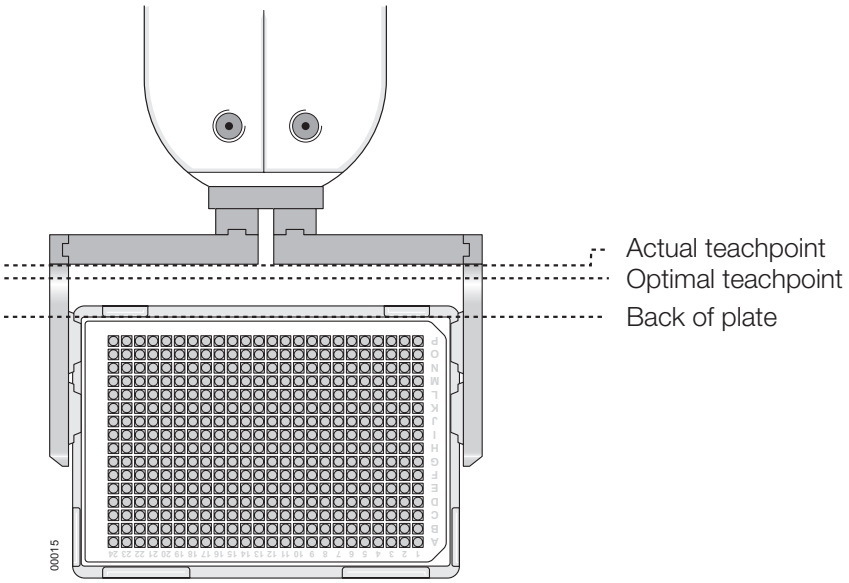
The Impact of Inaccurate Teachpoints

This section uses the example of a teachpoint that is inaccurate in the R-dimension to illustrate the implications of inaccurate teachpoints in general.

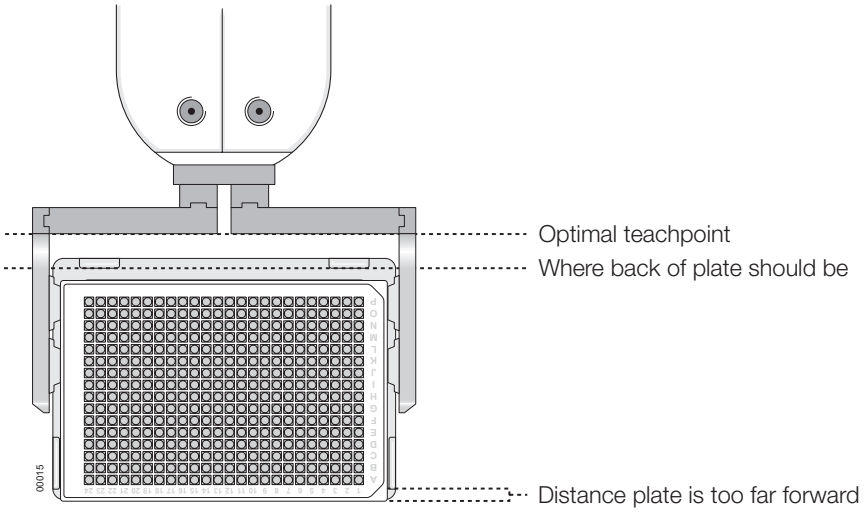
This first diagram shows where the gripper picks up a plate on a platepad when the R teachpoint is set accurately. Notice that the R teachpoint is aligned with the back of the gripper.



In the next diagram the R-value of the teachpoint is too small. The back of the robot gripper stops at the actual teachpoint, and the plate is held too far back in the gripper.



The next diagram shows what happens when this plate is delivered to a platepad that has an optimal teachpoint. The back of the gripper stops at the optimal teachpoint, delivering the plate too far forward so that it doesn't sit correctly in the platepad.



The ability to tolerate a deviation from the optimal teachpoint depends on the tolerance in the geometry of the device that receives the plate.

It is less important for the absolute value of the teachpoint for a plate position to be optimal than it is for the teachpoints of the position at which a plate is picked up and the position to which the plate is delivered to be work together. To explain further, if the teachpoint at the pick position is 1 mm less than the optimum R-value and the teachpoint at the place position is 1 mm less than the optimum, the end result is that the plate is placed accurately at the position. Also, if the teachpoint of the picking position has a R-value that is low by 1 mm and the teachpoint of the placing position has an R-value that is high by 1 mm, the combined effect is the plate being placed 2 mm forward of where should be.

These concepts explain that accurate placement of a plate is a property of the picking position's teachpoint and the placing position's teachpoint. Therefore when you are fine-tuning a teachpoint, you always need to consider the teachpoint of the position that a plate is collected from.

When teachpoints are initially set at the factory, they are defined as described in the following table.

Axis	Teachpoint Position is set when the...
R	Bumper of the plate calibration tool touches the back of the gripper.
T	Plate is centered in the gripper
Z	Bottom of the gripper is just above the bottom of the plate skirt, although in some cases, this needs to be adjusted because of specific plate geometry.

Fine-Tuning a Robot Teachpoint

The process of fine-tuning robot teachpoints is empirical. You make small, incremental adjustments until a plate can be accurately picked up and placed at a position. To help standardize the process, it is best to select one platepad to use as a reference picking position for all teachpoints.

Teachpoints are manipulated through the Robot Diagnostics software. You should be familiar with the features of this software before working with teachpoints. For more information about Robot Diagnostics, see "Using Robot Diagnostics Software" on page 167.

To fine-tune a robot teachpoint:

1. Examine the teachpoint coordinates for other devices that you know should be aligned in one or more axes with the device whose teachpoint you are working on.

   For example, all stackers sitting directly on the table and mounted in equivalent hole patterns should have very similar Z- and R-values. This may give you a clue about whether the teachpoint is inaccurate and in which direction.

2. If this is the first time that your BioCel has had its teachpoints fine-tuned, select a platepad to use as your picking reference position.

   If you have fine-tuned teachpoints before, make sure you use the same platepad for the picking reference position.

3. Click **Diagnostics**.

4. Click **Robot**.

   This opens the **Robot Diagnostics** window.

5. In the **Position 1** list box, select the reference platepad.

6. In the **Position 2** list box, select the device whose teachpoint you want to fine-tune.

7. Check the values for the **Departure Height** and **Approach Height**.

8. Set the **robot speed** to **slow**.

9. Click **Pick & Place 2>1**.

10. Carefully watch how the robot places the plate and listen to the sounds it makes.

    If the plate catches the lip of the plate position, because the R- or T-value is incorrect, it can make a double-click sound. If the Z-value is incorrect the plate will make a dropping sound or a crunching sound, depending on whether the value is too high or low.

11. When you have established the direction and approximate magnitude of the inaccuracy, set the jog increment.

12. Click the appropriate jog button to move the gripper, and click **Teach point here** for **Position 2**.

    This temporarily applies the new teachpoint setting. If you click **Cancel** the new setting will not be saved.

13. Using the **Pick & Place** function, move the plate back to the reference position, repeat the move to the place position, and look to see if the accuracy has improved.
14. Continue with this iterative process until the plate is placed correctly.
15. Click **Save & Exit** to save the new teachpoint.

Using QFill Diagnostics Software

About This Section

This section explains how to manipulate a Genetix QFill2 independently of VWorks, using QFill Diagnostics software.

For general information about diagnostics software, see "About Diagnostics Software" on page 166.

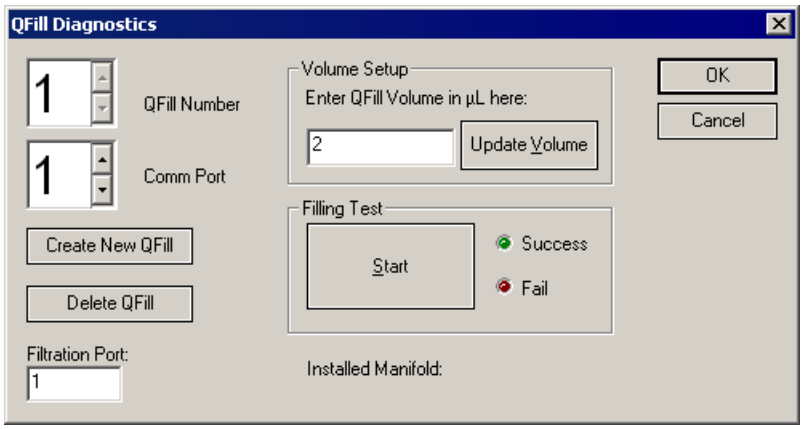
For brief information about setting up a QFill2, see "Q Fill2 Set Up Process" on page 70.

For detailed information about the QFill2, refer to the QFill2 user manual.

QFill Diagnostics Dialog Box

In stand-alone mode, QFill2s are operated using a built-in keypad. Velocity11 has developed QFill Diagnostics software to allow BioCel users to operate a QFill2 using the BioCel computer.

The software uses a single dialog box entitled QFill Diagnostics.



Basic Setup

Before you can manipulate a QFill2, you must make sure that it is correctly identified.

To make sure that the QFill2 is identified:

1. Check that the **QFill Number** is correct for the module that you want to communicate with.

   This number identifies a specific QFill2 when there is more than one on the BioCel. You can find out the number of a QFill2 by referring to the label on the module, by trial-and-error, or by looking at the **Device Number** in the device manager.

   For more information about the device manager, see "Managing Devices" on page 135.

2. Check that the **Comm Port** number matches the serial port number for the module that you want to communicate with.

   You can find out the **Comm Port** number from the label on the serial port cable near where it plugs into the QFill2. The number is also the same as the **Input number** in the device manager.

   This number should be added automatically when you select the QFill number once it has been defined for the first time, and you should not need to change it.

Creating and Deleting QFill Devices

You should not need to use the **Create New QFill** or **Delete QFill** buttons. These are for Velocity11 use only.

Changing Dispense Volume

You can change the volume of fluid dispensed by the QFill2.

To change the dispense volume:

1. In the **Volume Setup** group box, type the QFill volume into the text box.
2. Click **Update Volume**.
3. Click **OK.**

   The volume you last entered is saved until the next time a protocol is run, which will override this value.

Filling a Plate

Refer to the QFill2 user manual for information about preparing to fill a plate.

To fill a plate:

1. In the **Filling Test** group box, click **Start**.
2. Monitor the success of the fill by looking at the **Success** and **Fail** indicators.

   The **Success** and **Fail** indicators provide feedback from a sensor that measures pressure in the dispensing bottle. The **Fail** indicator light is illuminated if the:

   - QFill2 is not turned on
   - QFill2 has a disconnected communication cable
   - Bottle fails to pressurize

About the Filtration Port

The Filtration Port defines the Bio I/O port used to provide vacuum sensor information for an optional filtration station on the QFill2. You should not need to change this number.

Using Bio-Tek Diagnostics Software

About This Section

This section explains how to manipulate a Bio-Tek ELx405 automated microplate washer, using Bio-Tek Diagnostics software.

We strongly recommend that you read the Bio-Tek ELx405 Washer Operator's Guide before using the ELx405 on the BioCel. You can also refer to the less-detailed online help, which can be accessed from the Bio-Tek Diagnostics software.

For general information about diagnostics software, see "About Diagnostics Software" on page 166.

For important information about setting up a Bio-Tek ELx405, see "Bio-Tek Washer Set Up Process" on page 70.

For more information about adding a Bio-Tek Washer task when creating a protocol, see "Setting Bio-Tek Washer Task Parameters" on page 128.

About Bio-Tek Diagnostics Software

The Bio-Tek ELx405 can be controlled through the built-in keypad. In addition, Velocity11 has developed a user interface, which is the Bio-Tek Diagnostics software, to allow BioCel users to operate an ELx405 using the BioCel computer.

!! IMPORTANT !! If you use the ELx405 to create a program, you will not be able to access it through the Bio-Tek Diagnostics. If you create a program through the Bio-Tek Diagnostics you will not be able to access it through the keypad.

About Linked Programs

You cannot create linked programs using the Bio-Tek Diagnostics software. Instead, you can add two or more consecutive Bio-Tek Washer tasks to a protocol.

Setting Basic Properties

To set the basic properties:

1. From the **Program** list box, select a program.
2. From the **Plate washer model** list box, select the model of ELx405 that you have.

   !! IMPORTANT !! If you select the wrong model, VWorks will crash when you run the program through either Bio-Tek Diagnostics or a VWorks protocol.
3. From the **Plate type** list box, select the type of plate.
4. From the **Program type** list box, select the type of program to run.

   For more information about types of programs, see the Bio-Tek ELx405 Washer Operator's Guide.
5. From the **Buffer valve** list box, select the valve corresponding to the reagent that you want to use.

Creating a Program

You can create a program, which is a named collection of parameter settings, from the Bio-Tek Diagnostics software.

To create a program:

1. Click **New**.
2. Type a name for the program in the **New Program** dialog box.
3. Click **OK**.
4. Complete the parameter settings, as required, in the **Bio-Tek Diagnostics** dialog box.

   Refer to the parameter tables below and the parameters described in the Bio-Tek ELx405 Washer Operator's Guide.
5. Click **Save**.

Running a Program

You can run any program created using Bio-Tek Diagnostics software.

!! IMPORTANT !! Before running a program, you must make sure that the Bio-Tek Washer display does not read "UNDER EXTERNAL CONTROL." If it does, VWorks will freeze when you run the program and you will have to end the application from the Microsoft®Windows® Task Manager.

To run a program:

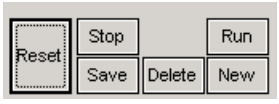
1. Select the program from the **Program** list box.
2. Click **Run**.

Resetting the Bio-Tek Washer

Resetting the Bio-Tek washer performs a software reset of the washer, which has the same effect as switching the power off and on. You might use this feature to recover from a suspected communication problem with the module.

To reset the Bio-Tek washer:

1. Click **Reset**.



Accessing Online Help

To open the Bio-Tek washer's online help:

1. Click **HELP ME!**

Running a Standard Program

The Bio-Tek Washer includes a number of standard programs, for uses such as measuring the accuracy and precision of dispense volumes.

!! IMPORTANT !! Before running a program, you must make sure that the Bio-Tek Washer display does not read "UNDER EXTERNAL CONTROL." If it does, VWorks will freeze when you

run the program and you will have to end the application from the Microsoft Windows Task Manager.

To run a standard program:

1. Select the program from the **Standard program** list box.
2. Click **Run**.

Parameters Tables

Some of the parameter names used in the Bio-Tek Diagnostics software are slightly different to the names given in the Bio-Tek ELx405 Washer Operator's Guide and online help. The names that are different are listed in the following tables to help you when looking up information.

Aspirate Parameters

Velocity11 Bio-Tek Diagnostics Label	Bio-Tek Parameter
Horizontal position	Horizontal Aspr Pos
Horizontal y-position	Horizontal Y Aspr Pos
Crosswise aspirate options	Crosswise On
Crosswise aspirate height	Crosswise Height
Crosswise horizontal position	Crosswise Horiz Pos
Crosswise horizontal y-position	Crosswise Horiz Y Pos
Final aspirate delay	Final Aspr Delay

Dispense Parameters

Velocity11 Bio-Tek Diagnostics Label	Bio-Tek Parameter
Prime before dispense	Prime Before Start?
Dispense volume per well	Dispense Volume
Horizontal position	Horizontal Disp Pos
Horizontal y-position	Horiz Y Disp Pos
Bottom wash volume	Bottom Disp Volume
Bottom wash flow rate	Bottom Flow Rate
Bottom wash height	Bottom Disp Height
Bottom wash horizontal position	Bottom Horiz Pos
Bottom wash horizontal y-position	Bottom Horiz Y Pos

Using iSeries Diagnostics Software

About This Section

This section explains how to use the iSeries Diagnostics software. For general information about diagnostics software, see "About Diagnostics Software" on page 166.

About Your Environmental Control

The environmental control capability on your BioCel is fully configured by Velocity11 before delivery and you should not need to make any configuration changes. You may occasionally want to interact with the iSeries Diagnostics software to monitor environmental conditions, make minor changes and troubleshoot communication problems with the iSeries controllers.

You will not need to use all of the features of the iSeries Diagnostics dialog box. Those procedures that are relevant to you are given in this section and in "Resolving Environmental Control Problems" on page 203.

How Environmental Control Works

An iSeries controller is a small box with a digital display, located behind a side door.

In the most general sense, an iSeries controller is used to maintain a particular environmental condition by providing feedback control for a sensor/effector pair.

A sensor provides a voltage or current input to an iSeries controller. The iSeries controller compares that voltage or current with the setpoint defined for a controller output. If the voltage or current is higher or lower than the setpoint by a particular margin the output device state toggles on or off, which creates a change in the environment.

In the case of temperature control, the sensor is a thermocouple and the effector is a heating element.

In the case of humidity control, the sensor is a hygroscope and the effector is a humidifier.

!! IMPORTANT !! Although it is possible to change environmental control settings directly using the iSeries controllers, we recommend that you do not do this. Attempting to make changes when VWorks is communicating with the iSeries controllers may corrupt data.

About iSeries Profiles

Each type of control has its own iSeries controller. For example, one controller may be used to control and display the table temperature and another to control and display the air temperature. Each controller is given its own profile in the iSeries Diagnostics software.

Naming an iSeries Controller

You may want to create a casual name for each iSeries controller.

To name an iSeries controller:

1. Click the **Profiles** tab.
2. From the **Profile name** list box, select the profile that you want to name.
3. In the **Output Parameters** group box, type the name in the **Output 1 friendly name** text box.

   Note: Currently, only Output 1 is used by the BioCel.

Viewing the Current Reading

You can view the current iSeries controller reading.

To view the current iSeries controller reading:

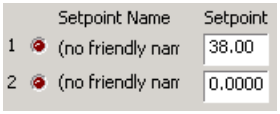
1. Click the **Status** tab.
2. View the display in the **Status** group box.

Note: The user-defined units label that is located above the display refers to measuring units, such as relative humidity percentage, that provide a voltage input using the iSeries Process mode. For more information about modes, see the iSeries documentation.

Changing the Setpoint

To change the setpoint value:

1. Click the **Status** tab.
2. In the **1** or **2** text box, as appropriate, edit the setpoint value.



Changing the Display Color

To change the color of the iSeries display:

1. Click the **Profiles** tab.
2. In the **Display Parameters** group box, select a color option for the **Normal Display color**.

Note: Changing the display color settings for Alarm 1 and Alarm 2 will have no effect on your system.

Changing the Number of Displayed Decimal Places

You can change the number of decimal places shown on the display. Depending on the input type, some options are inactive.

To change the number of displayed decimal places:

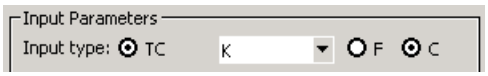
1. Click the **Profiles** tab.
2. In the **Display Parameters** group box, select an option for **Decimal places**.

Changing the Temperature Units

You can monitor and display temperature in degrees Celsius or degrees Farenheit.

To change the temperature units:

1. Click the **Profiles** tab.
2. Select a profile that measures temperature using a thermocouple from the **Profile name** list box.
3. In the **Input Parameters** group box, select either **F** or **C**, for Farenheit or Celsius.



4. Change the setpoint to reflect the new temperature units.

   For more information, see "Changing the Setpoint" on page 186.

Bio I/O Diagnostics Software

About the Bio I/O Diagnostics Software

The Bio I/O Diagnostics software is used by Velocity11 personnel for troubleshooting communication problems. You should not need to use the Bio I/O Diagnostics software.

Maintenance and Troubleshooting

7

This chapter tells you how to keep your BioCel® in good working order and what to do when you encounter a problem.

Routine Maintenance

Biocel Maintenance

The BioCel does not require a lot of routine maintenance.

In general, practice good housekeeping by cleaning up spills and following the procedures described in "Performing Post-Run Clean-Up" on page 90.

Once a month, check that the:

- ❑ Robot gripper pads are not torn, cracked, or otherwise worn
- ❑ Overhead doors remain at the correct height
- ❑ Liquid handling tubing is not torn, cracked, or discolored
- ❑ Air filter is clean
- ❑ Main air pressure reads 90–100 psi
- ❑ Table top is free of debris, such as pieces of chipped plates and microtubes

Checking the Air Filter for Replacement

If the house air supplied to the BioCel is clean, the air filter should rarely need to be changed.

For a diagram showing the location of the air filter, see "Air Panel" on page 29.

To check the air filter for replacement:

1. Open the air panel door by inserting a large flat-bladed screwdriver into the keyhole and turning clockwise.
2. Look through the window at the front of the air filter container.

   If there are any oil droplets on the bottom of the filter, or if there is general dirt, the filter should be changed. Contact Velocity11® for service.

Module Maintenance

For information about routine maintenance of the individual modules, see the relevant module documentation.

Replacing Fluorescent Tube Lights

The interior of the BioCel has standard type fluorescent tube lights that occasionally need to be replaced. We recommend that two people work together to replace a light.

To replace a fluorescent tube light:

1. If your BioCel has a light switch, turn off the lights.
2. Either shut down the BioCel or, at the power strip, unplug the power cord that goes to the light.
3. With one person working at each end of the light, pull down each of the lower, white plastic tabs that hold the light cover in place, and remove the light cover.
4. Remove the lamp.
5. Install a new, identical lamp.
6. Replace the cover, and snap the white tabs back into place.

About Error Handling

Causes of Errors

The BioCel is a complex instrument that requires the interaction of hundreds of parameters, configurations, and operator setup tasks for a protocol to run successfully. Errors on the BioCel have many causes, including poor protocol writing, incorrect operator setup, variation in plates, hardware failure and software failure.

It is important to understand that error handling is a normal part of operating the BioCel and that errors usually do not mean that the BioCel has malfunctioned.

Compilation Warnings and Errors

Compilation Warnings

Compilation warnings are displayed in the VWorks™ log toolbar, listing the task that caused the warning.

Warnings are generated, for example, when:

- ❑ Pipette tips are on the VPrep® head at the start of the protocol so a tips-off task is run before a tips-on task
- ❑ No label is printed during a VCode® task

Compilation Errors

Compilation errors are listed in the VWorks log toolbar, and a dialog box opens telling you how many errors were found. If you are logged in with Operator, User or Guest privileges, you will be unable to continue with the protocol. If you are logged in with Administrator privileges, the dialog box will allow you to run the protocol despite the errors.

Errors are generated, for example, when:

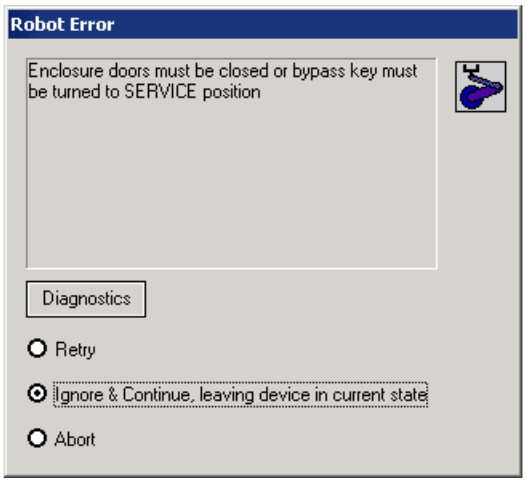
- ❑ Operating parameters are out of range, denoted by red text in fields of the Task Parameters toolbar
- ❑ A task asks a VPrep to pipette from a plate that does not exist in the system
- ❑ Volumes in pipette steps do not match, such as when a dispense volume is greater than a previous aspirate volume
- ❑ A specific stacker has not been assigned to a Stacker task
- ❑ A Signal task has no associated Waitfor task

Resolving Robot Errors

About Robot Errors

Robot errors are among the most common errors that occur during a run.

A typical robot error message is shown here.


Robot Error
Enclosure doors must be closed or bypass key must be turned to SERVICE position
Diagnostics
Retry
Ignore & Continue, leaving device in current state
Abort

Note: The text of the message may be different for VWorks and Robot diagnostics software. This section assumes that the error occurred while performing a run using VWorks.

Types of Robot Error

There are four types of robot error.

Error Type	Error Message
❑ Door interlock ❑ Emergency stop	While placing at <*location*> robot emergency stop or door interlock detected
Plate sensor	Failed to sense plate when picking from <*location*>
Servo	While placing at <*location*> a servo error has occurred

Door Interlock Error Recovery

A door interlock error occurs when an overhead door is opened during a run.

To recover from a door interlock error:

1. Make sure that the system is in a valid state for the protocol. In other words, make sure that you have not made changes that will cause a further error, such as moving a plate to a position that should not have a plate, or cause samples to be switched around, such as moving a plate from one VStack® module to another.
2. Close the overhead door that was opened.

3. In the **Robot Error** dialog box, select **Retry**, or **Ignore & Continue, leaving device in current state**, depending on the current state of the robot.

If you are an administrator you can use the interlock override to continue the run with the overhead doors open.

For more information about using the interlock override, see "Overriding the Safety Interlock" on page 199.

Emergency Stop Error Recovery

Emergency stop errors are generally more difficult to recover from than other types of error and should be handled by an administrator.

With an emergency stop error, power is cut to modules and devices, and VWorks loses information about the state that the modules and devices are in. This prevents VWorks from continuing the protocol.

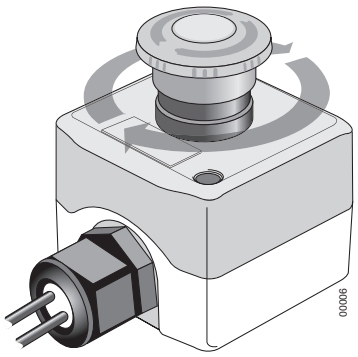
!! IMPORTANT !! You cannot continue the current protocol run after an emergency stop has been activated.

After an emergency stop button is pushed, all device motion stops and error messages are generated in the error log as the scheduler attempts to continue with the protocol.

To recover from an emergency stop:

1. Clean up any spills or debris if necessary.
2. Twist the activated emergency stop button in a clockwise direction.

   The spring-loaded button pops out.



3. Close any open doors.
4. Push the reset button on the power panel.

   A **stop** dialog box opens in addition to the **Robot Error** dialog box that is already open.

   For more information about the power panel, see "Side-Door Numbering" on page 28.
5. Activate the interlock override.

   For more information about overriding the interlock, see "Overriding the Safety Interlock" on page 199.
6. Move all VPrep axes to their home positions, which also dispenses any liquid in the pipette tips:

a. In VWorks, click **Stop**.

b. Click **Diagnostics**.

This opens the BioCel Diagnostics window.

c. Click the VPrep icon.

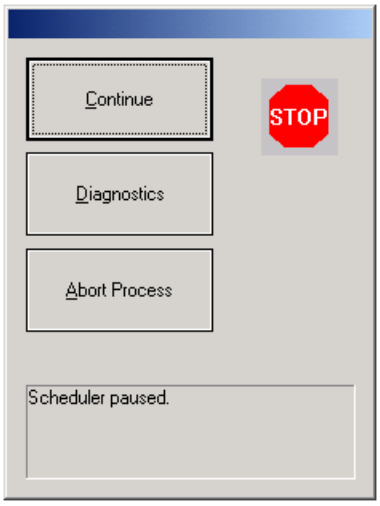
d. Place paper towels or an empty reservoir on the base of the VPrep module under the head.

e. Click **Reset**.

This dispenses any liquid in the pipette tips.

f. Clean up the dispensed liquid.

7. Click the close box to close the **Diagnostics** window.
8. If there is a plate in the gripper, move it back to the pickup location:
   a. Establish the location that the plate was picked from.
   b. In the **Robot Error** dialog box, click **Diagnostics**.
   c. Gently hold the plate in your fingers, or ask another operator to do the same.
   d. Click **Open Gripper** to release the plate to your hand and return the plate to the location that it was picked from.
9. Close all overhead doors.
10. Remove the interlock override key.
11. Push the reset button on the power panel.
12. Click **Abort Process** in the **stop** dialog box.



13. From the **File** menu, select **Exit**.

    This closes VWorks. When you restart VWorks, communication with the modules and devices that lost power is re-established.

Plate Sensor Error Recovery

Before you can recover from a plate sensor error, you must establish the cause of the error.

To recover from a plate sensor error:

1. If there is no plate in the gripper, establish whether the plate was:
   - Knocked out of the gripper

     In this case establish what knocked the plate out of the gripper and contact Velocity11.
   - Missing from the location that the robot attempted to pick it up from

     In this case, place the correct plate in the location and click Retry in the **Robot Error** dialog box.
   - Not picked up

     In this case, there may be a problem with either the labware definition for the plate or a teachpoint. Check the teachpoint at the position where it failed to pick up the plate, and also the teachpoint at the previous position. For information about checking teachpoints, see "Fine-Tuning Robot Teachpoints" on page 175. If there does not seem to be a teachpoint error, contact Velocity11™.
2. If the plate is held in the gripper but is not seated correctly, establish whether the plate was positioned correctly at the pickup location.

   If the plate was not positioned correctly at the pickup location, reposition the plate and click **Retry** in the **Robot Error** dialog box.

   If the plate was positioned correctly at the pickup location, there may be a problem with the labware definition for the plate, a teachpoint, or the plate sensor, and you should contact Velocity11.

Servo Error Recovery

The robot's motion is controlled by a servo system that cuts power to the robot if it encounters resistance to movement that is slightly higher than that expected from just the inertia of a plate. When the power is cut, a servo error is generated.

The great majority of servo errors occur when the plate being carried crashes into another plate sitting on a device. Rarely, a servo error will occur if a plate crashes into another object, such as a VPrep module shelf.

To recover from a servo error:

1. If the error was not caused by a plate crash the problem is probably an inaccurate teachpoint, in which case contact Velocity11 for assistance.
2. If the error was caused by a plate crash:
   a. In the **Robot Error** dialog box, click **Diagnostics**.
   b. In the **Diagnostics** dialog box, click **Home**.

      Do not click **Move to rest** because this moves the robot to the home position too quickly.
   c. Click the close box to close the **Diagnostics** dialog box.
   d. Make sure that the plates are still usable and in their correct positions.
   e. In the **Robot Error** dialog box, click **Ignore & Continue, leaving device in current state**.

Overriding the Safety Interlock

Procedure

This procedure should only be performed by a person with Administrator privileges.

To continue a run using the interlock override:

1. Insert the override key into the interlock key hole on the power panel and turn it clockwise to the zero position.
2. In the **Robot Error** dialog box, select **Retry**.

!! INJURY HAZARD !! Only fully trained BioCel administrators should have access to, and use of, the safety interlock key. Use the override only when you know how the robot and VPrep modules will move during the protocol, when the robot speed is slow, and when you have taken measures to keep away from the areas in which the robot and VPrep modules will be moving.

For more information about the interlock override, see "About Opening an Overhead Door During a Run" on page 82.

Resolving Platform Bar Code Reader Errors

Introduction

The information in this section refers to errors generated by the following platform bar code readers:

- ❑ Robot bar code reader
- ❑ Optional VPrep shelf bar code readers
- ❑ Optional platepad bar code readers

For information about resolving VCode bar code errors, see "VCode Errors" on page 202.

Types of Bar Code Misread Error

There are two types of bar code misread error.

Error Type	Description
Bar code no-read	A bar code reader is unable to read a bar code when it picks up a plate. For more information, see "Bar Code No-Read Errors" on page 200.
Bar code mismatch	The bar code of the plate that is picked up does not match the bar code that VWorks expects in that position. For more information, see "Bar Code Mismatch Errors" on page 201.

Bar Code Error Option

The result of a bar code misread error depends on the "Halt on barcode misreads" error option that you select. For more information about this option, see "Setting Error Options (Optional)" on page 57.

If the option is selected:

- ❑ The protocol pauses.
- ❑ An error is generated in the log.txt file and VPrep module log file.
- ❑ A dialog box opens, allowing you to enter the correct bar code.

If the option is not selected:

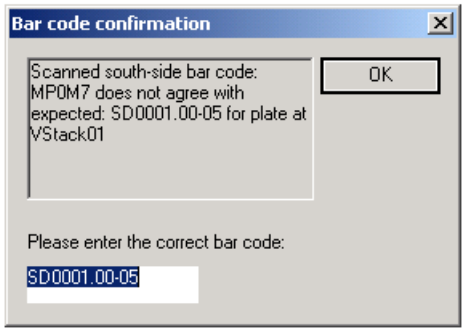
- ❑ An error is generated in the log.txt file and VPrep module log file.
- ❑ The protocol continues without pausing so there are no recovery steps.

Bar Code No-Read Errors

When a bar code cannot be read, and the "Halt on barcode misreads" error option is selected, an error message is generated stating "Could not read <*side*> bar code on plate at <*device*>."

Bar Code Mismatch Errors

When the plate that is picked up does not match the bar code that VWorks expects in that position an error message is generated stating "Scanned <*side*> bar code: <*scanned bar code*> does not agree with expected: <*expected bar code*> for plate at <*location*>."


Bar code confirmation
Scanned south-side bar code: MP0M7 does not agree with expected: SD0001.00-05 for plate at VStack01
OK
Please enter the correct bar code:
SD0001.00-05

Recovering From Bar Code Errors

To recover from a bar code error:

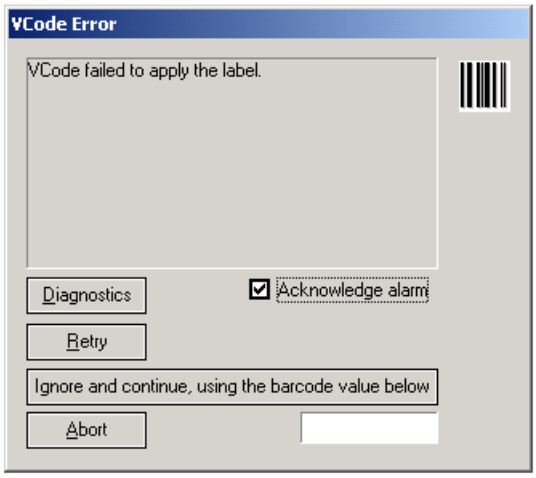
1. Enter the correct bar code in the text box of the **Bar code confirmation** dialog box.
2. Click **OK**.

   The run continues.

VCode Errors

About VCode Errors

VCode errors, which include bar code errors, are generated by VCode modules and displayed in VWorks. An example VCode error is shown below



For more information about resolving VCode errors, see the *VCode User Manual*.

Resolving Environmental Control Problems

Introduction

Refer to this section if your BioCel is equipped with environmental control options and there is a problem.

iSeries Controller Panel

The main iSeries controller panel has three digital readouts, three fuses, and three circuit breakers.

Replacing an iSeries Fuse

If the lights go out on an iSeries digital display, you will need to replace the fuse.

To replace an iSeries fuse:

1. Unscrew the fuse located to the left of the digital readout.
2. Screw in a new, identical fuse.

Resetting an Environmental Control Circuit Breaker

Three circuit breakers are located to the left of the iSeries digital readouts. If one of these breakers trips, it cuts power to either the:

- ❑ Table heating elements
- ❑ Air heating elements in the box suspended from the ceiling of the BioCel
- ❑ Humidifier

If the BioCel fails to maintain a temperature or humidity setting, reset the circuit breaker for the respective power line first. Attempting to reset a circuit breaker when the BioCel is operating will not cause a problem.

To reset an iSeries circuit breaker:

1. Push in the circuit breaker button.

If a breaker trips frequently, contact Velocity11 Service Center for help.

Resetting a Controller

If there appears to be a communication problem with an iSeries controller, you can reset the controller. This has the same effect as unplugging the controller power cord and then plugging it back in, but it avoids turning off the power.

To reset an iSeries controller:

1. If it is not already selected, click the **Status** tab.
2. Click **Reset**.

Resolving Plate Placing Errors

About Plate Placing Errors

If the robot does not place a plate accurately on a device, the problem could be with the:

- ❑ Teachpoint for either that device or for the previously scheduled device

  In this case see "Fine-Tuning Robot Teachpoints" on page 175 for more information about fine-tuning teachpoints.

- ❑ Labware definition

  In this case, edit the labware database. For more information, see the *VStack User Manual*.

- ❑ Plate

  In this case, replace the plate with one that is not deformed.

Resolving Lid Removal Problems

Problem

If your BioCel has a lid removal station, you may occasionally find that it does not function properly. If this happens, you will need to adjust the vacuum sensor that provides feedback on whether a lid is attached to the suction cups.

This adjustment requires you to turn the air on and off through the Bio I/O Diagnostics software while making incremental adjustments to the screw head that lies in the hole on the side of the station.

For help with this procedure, contact Velocity11 Service Center.

Parts Lists

A

This section lists those spare parts that we recommend you order before you need them. This will help to maintain your productivity as parts wear and require replacement.

The person at your company who will replace these parts should be trained to do it by Velocity11® service personnel.

Note: Some of these parts are for optional components that your BioCel® may not need.

PlateLoc Parts

The following table lists spare parts for the PlateLoc®.

Part Name	Part Number (MIID)	Suggested Quantity	Unit
Hot plate assembly	1968	1	Ea.
Vacuum ejector	1991	1	Ea.
Vacuum ejector with blow off	4193	1	Ea.
Vacuum tubing, internal	2792	1	Foot

Pump Module Parts

The following table lists spare parts for the VPrep® pump module.

Part Name	Part Number (MIID)	Suggested Quantity	Unit
Marprene tubing, 1/4–inch	8837	50	Feet (1 box)
Marprene tubing, 3/16–inch	8836	50	Feet (1 box)
Quick disconnect inserts, 1/4–inch	6126	5	Ea.
Quick disconnects, 1/4–inch	6125	5	Ea.

Robot Parts

The following table lists spare parts for the robot.

Part Name	Part Number (MIID)	Suggested Quantity	Unit
Rubber pad (robot gripper pad)	10891	1	Ea.

VCode Parts

The following table lists spare parts for the VCode®.

Part Name	Part Number (MIID)	Suggested Quantity	Unit
Vacuum pads	6397	1	Set

VPrep Parts

The following table lists spare parts for the VPrep.

Part Name	Part Number (MIID)	Suggested Quantity	Unit
Amplifier board (one per axis)	3184	1	Ea.
Barrels, 384d40	5422	10	Ea.
Bottom I/O boards	4972	1	Ea.
Channel barrels, 96d200	5362	10	Ea.
Channel barrels, 96d60	5456	10	Ea.
Channel pistons, 96d200	5421	10	Ea.
Flow controls	3851	2	Ea.
Needle Alignment Guide, 384f50	8553	1	Ea.
O-rings, 384d40/96d60	4284	500	Ea.
O-rings, 96d200	3812	10	Ea.
Pistons, 384d40/96d60	5940	20	Ea.
Polyurethane tubing, 1/8–inch multi-color	4052	4	Feet
Power entry module	2982	1	Ea.
Power Supply, 24V	2488	1	Ea.
Power Supply, 48V	2181	1	Ea.
Servo controller board	4134	1	Ea.
Shelf bracket	3075	1	Ea.
Solenoid valves	3890	2	Ea.
Standard shelf	4503	1	Ea.

Part Name	Part Number (MIID)	Suggested Quantity	Unit
Syringes, 384f50 w/o piston	5399	100	Ea.
Disposable head barrel wrench	11481	1	Ea.
Disposable tip O-ring lubricant	11482	1	Ea.

VSpin Parts

The following table lists spare parts for the VSpin™.

Part Name	Part Number (MIID)	Suggested Quantity	Unit
Amplifier board	6324	1	Ea.
Controller board	4134	1	Ea.

VStack Parts

The following table lists spare parts for the VStack®.

Part Name	Part Number (MIID)	Suggested Quantity	Unit
Rabbit processor	7840	2	Ea.
Stacker gripper pad	6212	1	Ea.

Other Velocity11 Products

The following table lists other Velocity11 products that you may want to order in advance of needing them.

Part Name	Part Number (MIID)	Suggested Quantity	Unit
Polyurethane tubing, 1/4–inch	5345	4	Feet
Quick connect union, 1/4–inch	1367	5	Ea.
Quick connect union, 1/8–inch	3901	5	Ea.
Quick connect union, 5/32–inch	3902	5	Ea.

Suggested Tools

Tools List

The following tools are not supplied by Velocity11 but are recommended for routine maintenance of your BioCel.

- ❑ Allen wrenches, metric measurement system
- ❑ Screwdrivers
- ❑ Needlenose pliers
- ❑ Open-end wrenches (spanners), Imperial measurement system
- ❑ Adjustable wrench (spanner)
- ❑ Plastic cable (zip) ties

Warranty

A

This chapter provides warranty information for North America. For the Velocity11® European Product Warranty, please request information by emailing service@velocity11.com.

North American Product Warranty

Velocity11, a California corporation with its principal place of business at 435 Acacia Avenue, Palo Alto, California 94306 ("Velocity11") is the obligor of this product warranty (“Product Warranty”).

This Product Warranty sets forth the terms and conditions under which Velocity11 will provide warranty related service to its customer (“Customer”) for Velocity11 products (“Products”).

1.0 Warranty Coverage

Velocity11 will provide warranty service as set forth below and pursuant to the terms and conditions of this Product Warranty for (1) one year after the later of the shipping date or the invoice date (“Effective Date”) of the covered Products.

1.1 The Product Warranty covers all part cost, labor cost, shipping cost, and travel expenses incurred by Velocity11 due to any defect that exists or occurs in materials or workmanship in any Products.

1.2 The Product Warranty covers software upgrades, firmware upgrades, electrical upgrades, and mechanical upgrades available from Velocity11. Upgrades are made available to Customer at the sole discretion of Velocity11. Upgrades are performed only when mutually agreed upon by Customer and Velocity11.

1.3 The Product Warranty covers whole unit replacement. If, at its sole discretion, Velocity11 determines that the defective Products should be replaced as a whole unit, Velocity11 reserves the right to replace the whole unit.

1.4 The Product Warranty applies only to Products located in the continental United States, Alaska, Hawaii, and Puerto Rico. If Customer relocates its Products to a geographic location in which the Product Warranty is not available, Customer may incur an additional charge to maintain the same warranty coverage at the new location.

1.5 All service parts removed from Products become Velocity11 property. Customer must pay the current retail price(s) for any service parts removed from Products and retained by Customer.

1.6 Within 30 days prior to the expiration date of the Product Warranty, Velocity11 will offer Customer the option of purchasing additional coverage based on the current Service Agreement rates at that time.

1.7 Velocity11 reserves the right to charge Customer hourly service rates, travel expenses, and current retail prices) for Products and/or component replacement costs in cases including but not limited to:

- 1.7.1 Products damaged by Customer or any third party.
- 1.7.2 Products altered by the Customer or any third party in a manner not explicitly stated in Velocity11’s published documentation, or without prior authorization from Velocity11.
- 1.7.3 Any Products with software that has been modified without written authorization from Velocity11.
- 1.7.4 Failure of Products due to Customer negligence. Customer abuse or misapplication, including but not limited to use of incorrect voltages, use of incorrect fuses, use of incompatible devices or accessories, and improper or insufficient ventilation; improper maintenance of Product’s air supply or other utility connections; use of Products other than as specified in the user manual; or other causes beyond the reasonable control of Velocity11, including but not limited to an act of God such as lightning, floods, tornado, earthquake, or acts of terrorism or war.
- 1.7.5 Products whose control software is installed on any computer hardware, operating system, or network environment that is not supported by Velocity11.
- 1.7.6 Products shipped by the Customer without packaging approved by Velocity11.
- 1.7.7 Products sold or transferred by the Customer to another entity.
- 1.7.8 Preventative maintenance costs, installation, reinstallation, uninstallation, relocation services or operating supplies.

2.0 Service Process

In order for Customer to receive warranty coverage, Customer must:

2.1 Initiate a service request by contacting Velocity11 at (800) 979-4811 or (650) 846-6523 or sending an E-mail to service@velocity11.com.

2.2 Provide the serial number of the Product, and the version numbers of all software components used by the Products.

2.3 Provide a detailed description of: (i) the problem, (ii) the specific error message and when it occurs, (iii) the activity or use of the Product when the error occurred, and (iv) remedial measures taken by the Customer to correct the error.

2.4 Follow procedures and recommendations provided by Velocity11 in an effort to correct problems via telephone. (VELOCITY11 WILL NOT DISPATCH A SERVICE TECHNICIAN TO PERFORM ON-SITE REPAIRS NOR ISSUE A SERVICE RMA (RETURN MATERIAL AUTHORIZATION) UNTIL THE TELEPHONE-BASED TROUBLESHOOTING PROCESS HAS BEEN EXHAUSTED).

2.5 **Shippable Products.** Products must be shipped directly to Velocity11 to be repaired. For shippable items, Velocity11, at its sole discretion, may ship out temporary replacement Products within twenty-four hours. The Customer will be responsible for shipping Products to be serviced back to Velocity11 in two working days after receiving temporary replacement Products from Velocity11. The Customer is responsible for following Velocity11's decontamination procedures prior to shipping Products back to Velocity11.

2.6 **Non-shippable Products.** After a Velocity11 service technician has determined that an on-site visit is necessary to repair Products, a service technician will be dispatched to the Customer's site the next business day, excluding holidays. Regular holidays shall include New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day. Additional holidays may fall within two days before or after listed holidays at Velocity11's sole discretion.

2.7 **On-site Service.** On-site service is available for Products within the United States. The technician must have the full street address of Products location. If Customer or Customer's authorized representative is not at the location when the service technician arrives, the service technician will leave a notice with the time of arrival as proof of arrival. Customer may be charged an additional fee for a second service call to repair Products.

2.8 Follow decontamination procedures provided by the Velocity11 technician prior to servicing by Velocity11. (VELOCITY11 WILL NOT SERVICE AN INSTRUMENT THAT HAS NOT BEEN DECONTAMINATED PER VELOCITY11'S DECONTAMINATION PROCEDURES).

2.9 Subject to Customer's applicable security requirements, provide Velocity11 with access to and use of all information and Products' facilities, including working space, electricity and a local telephone line, necessary for Velocity11 to provide timely Support Services pursuant to this Contract.

2.10 Read, and follow operating instructions and procedures as specified in Velocity11 documentation and other correspondence from Velocity11 related to Products.

3.0 Fee Schedule

The cost of the Product Warranty is included in the list price of Products.

4.0 Term and Termination

4.1 The term of this Product Warranty is one (1) year from the Effective Date unless earlier terminated in accordance with this Product Warranty. The Customer will be notified within thirty (30) days prior to the expiration date of the Product Warranty.

4.2 Velocity11 may terminate the Product Warranty if Customer breaches any provision of this Product Warranty and such breach is not remedied within thirty (30) days after Customer receives written notice of the breach.

4.3 Customer may terminate the Product Warranty if Velocity11 materially breaches its obligations under the Product Warranty and such material breach is not remedied within thirty (30) days after Velocity11 receives written notice of the breach from Customer.

5.0 Limited Warranty

Velocity11 warrants that service provided under this Product Warranty will be performed with the same or better degree of skill and professionalism as is demonstrated by like professionals performing services of a similar nature.

6.0 Limitation Of Liability

6.1 **Direct Damages.** VELOCITY11'S SOLE LIABILITY AND CUSTOMER'S EXCLUSIVE REMEDY FOR DAMAGES WITH RESPECT TO THE PRODUCT WARRANTY UNDER ANY CONTRACT, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHER THEORY, SHALL BE LIMITED TO THE AMOUNT PAID BY CUSTOMER FOR THE PRODUCT WARRANTY.

6.2 **Consequential Damages.** UNDER NO CIRCUMSTANCES, INCLUDING NEGLIGENCE, SHALL VELOCITY11 BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOST PROFITS, LOSS OF DATA, OR COSTS OF PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, ARISING IN ANY WAY OUT OF THIS CONTRACT OR THE USE OF THE LICENSED PRODUCT, DESIGN TECHNICS, AND DOCUMENTATION.

7.0 Entire Agreement

This Product Warranty constitutes the entire agreement between the parties regarding the subject matter described herein and supersedes all previous agreements or representations, oral or written, regarding the subject matter. This Product Warranty may not be modified or amended except in a writing signed by a duly authorized representative of each party. Both parties acknowledge having read the terms and conditions set forth in this Product Warranty and understand all terms and conditions, and agree to be bound thereby.

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